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R & D PROJECTS & PROPOSALS FOR
IV & V FIVE YEAR PLANS AND SOME
PERSPECTIVES FOR
VI FIVE YEAR PLAN

SUMMARIES

JANUARY 1972



CENTRAL FOOD TECHNOLOGICAL
RESEARCH INSTITUTE, MYSORE-2A

R & D PROJECTS AND PROPOSALS

for

IV & V FIVE YEAR PLANS

and

PERSPECTIVES

for

VI FIVE YEAR PLAN

SUMMARIES

JANUARY 1972

THE HISTORY OF THE

The first part of the history of the
United States is the history of the
colonies. The colonies were founded
by Englishmen who had come to
America in search of a better life.
They found a land of freedom and
opportunity, and they built a new
society based on the principles of
liberty and justice for all.

The second part of the history of the
United States is the history of the
Revolution. The colonies had grown
used to the rule of the British
government, but they were not
happy with the way the British
government treated them. They
wanted to be free to govern
themselves, and they fought a
war to win their freedom. The
Revolution was a great success,
and the United States was born.

The third part of the history of the
United States is the history of the
Union. The United States was
founded as a union of thirteen
states, and it has grown to be
a union of fifty states. The
Union has been a great success,
and it has brought peace and
prosperity to the people of the
United States.

P R E F A C E

The summaries of the R&D projects presented in this document represent inter-disciplinary research and development work on well identified time targeted projects on each of which a team of 4-6 scientists from specialised fields work to solve the problems of economic value and scientific interest.

The Institute at present is capable of undertaking 80-90 R&D projects as defined above, including the R&D projects financed by the grants under PL-480 schemes. These schemes are, for the present, sanctioned upto March 1973. With the availability of personnel formally approved for this Institute as its core strength, it will be possible to undertake about 20% more work. If the present strength of personnel drops with the closure of research projects financed by PL-480 Funds, alternate arrangements will have to be made as the work is of national importance.

The number of projects included under each of the IV and V Five Year Plans is larger than 90 as newer projects will be undertaken on completion of the existing ones. Some of the projects will spill over from one plan period into another.

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THE HISTORY OF THE

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CENTRAL FOOD TECHNOLOGICAL RESEARCH
INSTITUTE, MYSORE 2A

SUMMARIES OF THE R&D PROJECTS AND
PROPOSALS FOR IV & V FIVE YEAR
PLANS AND SOME PERSPECTIVES
FOR VI FIVE YEAR PLAN

INTRODUCTION

The Central Food Technological Research Institute was started in 1950 with quite broad-based terms of reference to work in the field of food science and technology. The activities of the Institute were reorganised in 1964 with the following main objectives:

- 1) To gear the research and development programmes of the Institute to the industrial and economic development of the country for achieving self-reliance and earning more foreign exchange through export of finished food products and assisting in Defence efforts.
- 2) To optimise the available resources of men, material and finance for achieving the objective of solving the food problems and stimulating economic growth.
- 3) To provide an atmosphere for increasing creativity and building self-confidence among research workers to accept greater responsibility with accountability.

4) To train personnel for meeting the specific needs of the various food industries, research, development and training programmes to fulfil the techno-economic needs of the country.

The above objectives called for a fresh and thorough examination of the situation existing in the area of post-harvest technology of foods. This study indicated that there was an urgent need to lay emphasis on technology and nutrition of cereals and legumes which constitute 80 per cent of our diet. High priority was given for work on prevention of losses during storage, handling, milling, processing, packaging and waste utilisation to manufacture of by products. Emphasis was increased on work to improve earning of foreign exchange through manufacture of products like essential oils, spice extractives and products of exotic taste. New Disciplines in the Institute were started and high priority given to the programme of greater economic value in certain fields which did not exist earlier. Emphasis on development of protein foods to meet the consumer needs was also increased to ensure greater and more efficient utilisation of legumes and oilseeds. Work in other disciplines such as infestation control and pesticides, fruit and vegetable technology, meat, fish and poultry technology was reoriented according to the needs of the industry and the country. Process development and design discipline was started and the engineering component of each project was adequately worked out for ensuring better commercial utilisation of the results of research. Industrial consultancy service was started in the Institute; its activities have increased more than three times over the last eight years.

Instead of 428 problems on which the Institute was working, about 90 inter-disciplinary projects were formulated with time targets to find solution for well identified problems of techno-economic and scientific interest. The new pattern of research organisation and management worked out in 1964 has been reported in the paper "National Science Policy and the Organisation of Project-oriented Research at CTRI, Mysore" (Symposium on O.R., Defence R&D Organization and O.R. Society of India, New Delhi, Feb. 1965). It provides not only for proper formulation of research projects but also a built-in-system of evaluation of the progress of work from time to time.

The Institute work was comprehensively reviewed first in 1964 prior to reorganisation and again in 1969. Over the last two months a detailed exercise has been carried out to (1) review the programme of work in progress under the IV Five Year Plan, (2) formulate project proposals for the V Plan and (3) prepare an outline of some perspectives for the VI Plan.

The above has been done in the light of the revised Charter proposed for the Institute in November 1971 based on the decisions of the Directors' Conference - Poona, October 1971 - which discussed the recommendations of the Sarkar Committee Report - Part II.

Several projects shown under the V Five Year Plan can really be undertaken earlier if the resources and facilities can be provided.

CFTRI covers today 15 major disciplines of food science and technology. Yet, the annual budget of the Institute is only Rs 95 lakhs (both recurring and capital) and includes the financial grant of Rs 12 lakhs under PL-480 supported schemes which are sanctioned upto March 1973. Yet, the Institute has spared no efforts and has done work which has made significant impact and has resulted in national and inter-national recognition. There is no doubt that the Institute has much more to do in our country, 50% of whose GNP comes from agriculture. For an institution covering 15 major disciplines of work, more resources should be made available in order to make greater impact on economic progress and employment through faster development of agro-industries. A further change in the organisational structure and management pattern to fulfill greater responsibilities ahead has become essential. This was pointed out to the Working Group appointed by the CSIR in 1965 wherein it was stated that CFTRI should be converted into National Institutes of Food Science & Technology. Again this concept was further clarified indicating the pattern of management which this Institute required in the paper entitled "Planned Transformation of CFTRI into a Multi-Disciplinary Food Science and Technology Research Development (Council) Organisation".

In the interest of country's industrial development, particularly that of agro-industries, it is very essential that research, development and training in the area of post-harvest technology should keep pace with the progress being made in the country in pre-harvest technology. Unfortunately,

post-harvest technology has not been given the same degree of attention and support by way of financial resources. This is clear from the fact that the budget of ICAR has gone up from Rs 11.6 crores in 1967-68 to Rs 34.1 crores in 1972-73 while the budgets of certain specialised laboratories such as IARI, IVRI and NDRI are Rs 2.83 crores, Rs 1.45 crores and Rs 1.10 crores respectively. As against this, the budget of CIFTI which has to cover post-harvest technology work relating to a large number of specialised areas still remains at nearly Rs 0.95 crore.

It is imperative to take steps at the earliest to carry out further expansion and development of the work in the area of post-harvest technology as recommended to CSIR earlier if real benefits of the Green Revolution are to be realised through the use of post-harvest technology. Its application to reduce the food losses even by 50% can make the country surplus in food, improve the quality of diet and raise the standards of nutrition of our people. Already, over the last eight years, the Institute has sold 25 processes to 82 firms; is acting as consultants to nearly 400 organisations and attending to over 4000 technical enquiries as compared to 1300 in 1963. This summarizes the impact of the Institute on industry and economy of the country. The demands on the Institute will continue to increase in future. Much more needs to be done if the pace of country's progress has to be increased for achieving greater degree of self-reliance.

The project proposals are prepared after identifying the economic, technological and scientific problems, taking into consideration the ultimate user interest. Whenever need arises work on other R&D projects of high priority can be taken up, by either making provision for the required additional resources or by shifting priorities of the projects proposed here. The former approach would however be more appropriate as the projects already proposed in this volume are also of sufficiently high priority for scientific and economic development of the country and for the solution of our food problem.

The Executive Council of the Institute studied carefully the need for a minimum expansion to be carried out with the existing structure and recommended a core strength for the staff and certain facilities such as accommodation and equipment. This has been approved and it is hoped that funds to implement the recommendations would be provided soon. The V Five Year Plan proposals are based on the availability of the staff and facilities. Advance action for this is necessary.

TITLES OF R&D PROJECTS FOR IV FIVE YEAR PLAN

"RESEARCH UTILISATION"

Sl. No.	Title	Page
1.	Technical assistance for industrialists to set up plants for spice extractives	7
2.	Demonstration of infestation control techniques on most susceptible commodities in selected cooperatives (one in each State) in the country	8
3.	Dehydration of Anab-e-shahi grapes	9
4.	Preparation of feasibility reports of completed projects	10
5.	Setting up of wineries and distilleries for the manufacture of fruit wines and brandies	11
6.	Sample production of fruited cereal flakes and fruit juice powder for export test marketing (to be supplied to Processed Foods Export Promotion Council)	12
7.	Studies on the preparation and production of low methoxyl pectin from lime wastes (<u>Citrus aurantifolia</u>)	13
8.	Mechanisation of wax coating treatment of Nagpur 'Santra'	14
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10.	Extension of Improved technique for milling of rice and utilisation of by-products in Gujarat and Maharashtra States	16
11.	Industrial extension and demonstration of processes for production of (i) fish meal and oil, and (ii) salted and unsalted semi-dried fish products	17
12.	Development of Miltona and Flavoured Vegetable Milk	18

Discipline: Plantation Products
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Technical assistance for industrialists
to set up plants for Spice extractives

2. Justification:

The process for Oleoresin from major spices
has been released to 9 firms and it is necessary
to establish production by them during
the IVth Plan.

3. Objectives:

To help the firm in setting up plant for
production of oleoresin and to train their
personnel in quality control and solve
teething problems of the industry.

4.1 Nature of Investigation:

-

4.2 Classification:

Utilization

4.3 Orientation:

Export Promotion

4.4 Collaboration:

Discipline of
Process Development
& Design

5. Period:

January 1972 to March 1974.

Discipline: Industrial Research,
Consultancy and
Extension

SUMMARY OF PROJECT PROPOSAL

1. Title:

Demonstration of infestation control techniques on most susceptible commodities in selected co-operatives (one in each State) in the country.

2. Justification:

There are 3342 cooperatives in the country handling, storing and marketing 80,00,000 tons of commodities. Due to indefinite storage period, pest ridden ecological conditions and want of disinestation facilities the commodities suffer qualitative and quantitative losses. The losses are very heavy and if prevented can save about 4,00,000 tons valued at Rs 40,00,00,000.

3. Objectives:

Demonstration of infestation control techniques are necessary to prove to the co-operatives the profitability of adopting disinestation measures.

4.1 Nature of investigation: -

4.2 Classification:

Extension/Research
Utilization

4.3 Orientation:

Conservation and in
effect import
substitution also.

5. Period:

April 72 to March 77.

Discipline: Industrial Research,
Consultancy and
Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Dehydration of Anab-e-Shahi grapes.

2. Justification:

India imports Rs 2 to 2.5 crores worth of dried fruits in a year in the form of raisins and other fruits. Exports are very meagre and confined to Nepal. In about 10,000 hectares Anab-e-Shahi grapes are presently grown in Hyderabad and other varieties are also grown in other parts of the country. Some growers in Hyderabad have approached us for helping them in the manufacture of raisins by using solar energy.

3. Objectives:

To translate the laboratory know-how to growers.

4.1 Nature of investigation:

-

4.2 Classification: Extension/Research
Utilization

4.3 Orientation: Import substitution,
export promotion and
raw material utilization

5. Period: Jan. 72 to Jan. 74.

Discipline: Industrial Research,
Consultancy and
Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation of feasibility reports of
completed projects.

2. Justification:

Presently we have requests from various industrialists for submitting feasibility reports on projects, like apple juice and concentrate, paddy milling, albumen flakes, wine and brandies, instant coffee and tea, salted peanuts/cashewnuts, weaning foods, cold storages. Similar request for the submission of project reports either based on the institute work and/or on literature data are to be attended to.

3. Objectives:

Utilisation of indigenous know-how and helping the industrialists in establishing economically viable units.

4.1 Nature of investigation: -

4.2 Classification: Consultancy/Res.
Utilization

4.3 Orientation: Raw material utilization and import substitution.

5. Period: Jan. 72 to March 76.

Discipline: Industrial Research,
Consultancy and
Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Setting up of wineries and distilleries
for the manufacture of fruit wines and
brandies.

2. Justification:

Seasonal fruits like grapes are facing a
glut in the market with green revolution.
Fruits like cashew apple are not utilised
for any purpose. Exports of banana are also
slackened. Utilisation of all the above
fruits and others will reduce the glut of
fruits and also produce quality liquors
rather than the liquors from alcohol based
on sugar molasses.

CFTRI has been appointed as consultants for
setting up of brandy units by two firms.
Negotiations are in progress with five
parties for appointing CFTRI as consultants
for their wineries and distilleries.

3. Objectives:

To translate the laboratory know-how to
industry.

4.1 Nature of investigation:

-

4.2 Classification:

Consultancy,
Research utilisation
& Extension

4.3 Orientation:

Raw material
utilisation

5. Period:

Jan.72 - Jan.75

Discipline: Industrial Research,
Consultancy and
Extension.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Sample production of fruited cereal flakes and fruit juice powder for export test marketing (to be supplied to Processed Foods Export Promotion Council).

2. Justification:

Fruit products like pickle, chutney, juice nectar, pulp and canned fruits are now exported from the country; during 1969-70 16,540 tons of these products valued at Rs 3.87 crores have been exported; in addition to these products sophisticated products like fruited cereal flakes and fruit juice powder the know-how of which has been developed in the Institute have got potential export market. There is no commercial production of these products in the country now. In the absence of any sizable quantity of sample of these products, the Processed Foods Export Promotion Council is not in a position to explore export market. Hence, in order to assist this organisation in its efforts adequate quantity of samples of these products will be prepared and supplied to this organisation.

3. Objectives:

Different formulations of fruited cereal flakes will be tried and 500 kgs each of fruited cereal flakes and fruit juice powder (mango) will be prepared and handed over to the Processed Foods Export Promotion Council for export test marketing.

4.1 Nature of investigation:

-

4.2 Classification:

Product Extension/
Research utilisation

4.3 Orientation:

Export Promotion

5. Period:

March 73 to Decr. 74

Discipline: Fruit and Vegetable Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the preparation and production of low methoxyl pectin from lime wastes (Citrus Aurantifolia).

2. Justification:

Low methoxyl pectin is a valuable gelling material for the food processor. The projected demand will be approximately 15 tons valued at Rs 10 lakhs. The entire demand of the country is met by import alone. This product can also be substituted in place of gelatin and agar-agar in certain food preparations. Gelatin and agar is also being imported to the tune of 34 lakhs rupees annually. The raw material for the preparation of low methoxyl pectin are lime fruit peels which is a waste material for the lime juice manufacturer and is available in substantial quantities. In order to maintain and expand the production of pectic materials and also utilize more wastes, it is necessary to broaden their market by developing products of greater versatility than ordinary pectins. The technical know-how for the preparation of their products has not been worked out in the country so far.

3. Objectives

1. To stop import of low methoxyl pectin and save foreign exchange
2. To increase the pectin production in the country.
3. To utilise the industrial waste material in increased quantities.
4. To promote lime fruit juice industry and also the production of different classes of food products which in turn gives more employment potential for the rural population.

4.1 Nature of Investigation: Developmental

4.2 Classification: Process/Product
Research/Extension/
Res. utilization.

- 4.3 Orientation: Import substitution, waste utilization, raw material utilisation, creation of more industries and employment.
5. Period: April 72 to March 1975

Discipline: Experiment Station,
Nagpur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Mechanisation of wax coating treatment
of Nagpur "Santra".

2. Justification:

Work done earlier on wax coating of oranges has shown that the storage life of Nagpur Santra under ambient conditions can be extended to about 20 days and is economically beneficial to the extent of Rs 5/- per case on transport to distant markets like Delhi and Amritsar, etc. The decay level has been kept down to 5% during about 20 days storage period under ambient conditions. There is a demand for oranges in export market like Singapore, Hong Kong and Kuwait etc. to a minimum extent of 65 tons as indicated by the S.T.C. to begin with and can be very well developed further to a large extent. There is a need to mechanise the wax coating treatment, to handle about 10 tons of oranges per day particularly to meet the export demand.

3. Objectives:

1. To fabricate and set up an experimental plant for carrying out trials on wax coating treatment on Nagpur oranges and on the basis of these trials to prepare the final blue print of the plant. This will enable the primary growing industry to create a nucleus of a model packing shed and meet the immediate export demand.
2. To organise centres for grading, wax coating treatment and packing of oranges for despatches to distant markets in the country as well as export markets.

4.1 Nature of Investigation:

4.2 Classification :

Design and Fabrication,
Extension and Research
Utilisation

4.3 Orientation:

Export Promotion and
Conservation

5. Period:

April 72 to March 74.

Discipline: Experiment Station,
Nagpur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Extension of Dal Milling technique
developed by CETFI to demonstrate
the cost benefit ratio.

2. Justification:

Nagpur is a big dal milling centre for the
pulses grown in Nagpur District and its adjoining
area. There is thus a definite need to
modernise the existing dal mills by adopting
the improved technique.

3. Objectives:

1. To popularise the improved techniques.
2. To modernise atleast two existing dal mills
at Nagpur

4.1 Nature of investigation:

-

4.2 Classification:

Extension, Research
utilisation

4.3 Orientation:

Raw material conser-
vation

5. Period:

April 72 to March 73

Discipline: Experiment Station,
Bombay

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Extension of Improved Technique for
milling of rice and utilization of
by-products in Gujarat and Maharashtra
States

2. Justification:

CFTRI has developed improved type of roller for
minimising the wastage. By adopting such modern
techniques the yield can be increased and rice
bran which is utilised as cattle feed can be
diverted to oil extraction plant to process for
edible oils.

3. Objectives:

Dissemination of the improved rice milling
technique developed at the Institute to the
country.

4.1 Nature of investigation:

4.2 Classification:

Extension, Research
utilisation

4.3 Orientation:

Wastage utilisation
and raw material
utilisation

5. Period:

March 72 to March 74

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Industrial extension and demonstration of processes for production of (i) fish meal and oil, and (ii) salted and unsalted semi-dried fish products.

2. Justification:

The fish meal and oil industry in India is still a cottage industry and only a couple of units have started operating with modern machinery. There is need to upgrade quality of the products and to render technical help to develop the industry on modern lines, to prevent wasteful use of seasonal glut of marine fish.

Similarly, there is need to improve the quality of dried or salted and dried fish products which are traditionally prepared as a means of saving seasonal glut of fish for off-season food uses.

3. Objectives:

1. Demonstration of improved processes for fish meal and oil production and preparation of improved quality dried or salted and dried fish products.
2. Industrial extension for break-through in transformation of a primitive occupation to a technically oriented industry.

4.1 Nature of Investigation: -

4.2 Classification:

Extension, Research
Utilization

4.3 Orientation:

Raw material
utilization

5. Period:

Sept.72 to June 74.

Discipline: Protein Tech.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of Miltone and Flavoured Vegetable Milk

2. Justification:

The feasibility of extending the available milk supplies through toning of milk with vegetable proteins has been established; Miltone based on isolated groundnut protein and milk is being produced at Bangalore and Mysore for slum feeding programme of the Social Welfare Board. Flavoured Sterilized Miltone has found acceptance as a beverage drink and is being test marketed. The product offers great potential for commercial development. Use of vegetable proteins can obviate the necessity to import skim milk powder.

3. Objectives:

1. Increasing the existing production of Miltone (2000 litres per day) at Bangalore to 20,000 litres with the collaboration of Food & Nutrition Board and UNICEF.
2. Setting up units of Miltone at two more centres.
3. Further research and development on flavoured beverages to improve the quality.

4.1 Nature of Investigation:

4.2 Classification: Extension, Res. utilization

4.3 Orientation: Welfare/Import substitution

5. Period: Jan.72 to March 74.

TITLES OF R&D PROJECTS FOR THE IV FIVE
YEAR PLAN

"APPLIED RESEARCH"

<u>Sl.</u> <u>No.</u>	<u>Title</u>	<u>Page</u>
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5.	Incorporation of Arecanut in Chewing gum and tooth paste	31
6.	Better utilisation of low grade coffee for Caffeine, fat, roasted coffee and soluble coffee	32
7.	Improvements in processing and diversified uses of spices - cardamom, pepper, chillies, turmeric and coriander	33
8.	Development and application of improved selective protectants and techniques for storage of food in rural areas	34
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13.	Development of methods and machinery for the economic milling of common pulses	39
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Discipline: Plantation Products
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Spice extractives from minor spices like Coriander, Celery, Cumin, Fenugreek, Cinnamon, Dill and Turmeric.

2. Justification:

The process developed at the Institute for extraction of oleoresin from major spices have been taken up by a number of parties. To help them to market a wide range of products, development of techniques using minor spices will be essential.

3. Objectives:

To study the varietal variations and standardise a procedure for oleoresins from minor spices.

4.1 Nature of Investigation:

Applied

4.2 Classification:

process research

4.3 Orientation:

Export promotion

4.4 Collaboration:

Discipline of
Process Development
and Design

5. Period:

April 72 to March 76

Discipline: Plantation Products
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Minimising the loss of the volatiles in dehydrated onion and garlic.

2. Justification:

Dehydrated onion and garlic are being manufactured by two different firms in India. A certain percentage of these dehydrated materials is also being exported. The industry has expressed the difficulty in retaining the original aromatic principles in the dehydrated product. It is reported that about 95% of volatiles are lost during dehydration. Therefore, there is a need for minimising the loss of flavour volatiles during dehydration so that the improved product may find a better export potential.

3. Objectives:

To understand the nature of flavour loss, characterise the flavour components in the raw and dehydrated materials and to incorporate the deficient flavour.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Export promotion

5. Period: April 73 to March 75.

Discipline: Plantation Products
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Instant Tea: Experimental Studies

2. Justification:

Earlier bench trials at the Institute have given a satisfactory product and the present studies are extension on a large scale to help the industry.

There is an increasing rate of consumption of instant tea especially in the developed countries like U S A. At present instant tea is produced mostly in the importing countries using black tea as the raw material. India being a major producer of tea, it is more economical to produce this product from green tea leaf and also to develop an indigenous know-how for the process in order to help local industrialists.

3. Objectives:

To set up a continuously operating unit to produce instant tea for evaluation and wide consumer acceptance, to provide the industry with indigenous know-how, to prepare a project engineering report on the process and to help the industry in setting up a production plant.

4.1 Nature of investigation: Applied

4.2 Classification: Process research,
product research,
Design & Fabrication

4.3 Orientation: Defence, Export promotion

4.4 Collaboration: Discipline of Process Development and Design

5. Period: April 72 to March 74.

Discipline: Plantation Product
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Improvements in cashewnut processing
with reference to conditioning,
shelling, drying and peeling.

2. Justification:

India exports over 63,000 tonnes of cashewnuts
earning over Rs 600 millions a year. At present
the industry is importing 60-65% of raw materials
from African countries where until recently no
processing was undertaken. Mechanisation has
been introduced in these countries. It is then
essential to take steps to meet this competition
and to improve the technology utilised by our
industry so as to bring down the cost of produc-
tion.

3. Objectives:

To improve the processing steps in conditioning,
shelling and drying of cashew.

4.1 Nature of investigation: Applied

4.2 Classification: Process research, product
research and design and
fabrication

4.3 Orientation: Export promotion

4.4 Collaboration: Process Development
and Design Discipline

5. Period: July 72 to March 74.

Discipline: Plantation Products
& Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Incorporation of Arecanut in Chewing
gum and tooth paste.

2. Justification:

India's production of arecanut is around
1.35 lakh tonnes. The increase in production
in recent years has been so much that not only
have we completely stopped imports but also
may have surplus very soon. Therefore, it is
necessary to find diversified uses for arecanut.

3. Objectives:

To incorporate active components of arecanut
in products like tooth paste, chewing gum etc.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Raw material
utilisation

5. Period: July 73 to June 74.

Discipline: Plantation Products
& Flavour Tech.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Better utilisation of low grade coffee
for Caffeine, fat, roasted coffee and
soluble coffee.

2. Justification:

Nearly 9,000 tonnes of lower grades of coffee
could be utilised for recovery of fat and
caffeine and the resultant product could
still be used as beverage coffee, thus consi-
derably improving the economics of utilisation.

3. Objectives:

To standardise a procedure for removal of
caffeine, fat from coffee and utilising the
resultant product as roasted coffee.

4.1 Nature of investigation: Applied

4.2 Classification: Process research,
product research

4.3 Orientation: Raw material
utilisation

4.4 Collaboration: Discipline of
Process Development
and Design

5. Product: April 72 to March 74

Discipline: Plantation Product &
Flavour Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Improvements in processing and diversified uses of spices - cardamom, pepper, chillies, turmeric and coriander.

2. Justification:

India produces about 886,160 tonnes of spices and earns foreign exchange of about Rs. 39 crores. In order to meet the challenge of competition from other countries it is necessary to improve our quality and up to-date thechnology of processing besides reducing the cost of production and improving the productivity.

3. Objectives:

i) The main objective is to introduce improved cleaning, grading and drying equipment to upgrade the quality and meet the challenge of competition in the world market.

ii) To find diversified use of spices and modernization of traditional foods with spices.

4.1 Nature of Investigation:

Applied

4.2 Classification:

Material research,
process research and
extension.

4.3 Orientation:

Export promotion and
raw material utilization.

4.4 Collaboration:

Discipline of Product
Development & Design.

5. Period:

April 1972 to March 1976.

Discipline: Infestation Control &
Pesticides.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development and application of improved selective protectants and techniques for storage of food in rural areas.

2. Justification:

More than 70 per cent of the total foodgrains production (110 million tonnes) are stored and consumed in the rural areas. About 30% is the marketable surplus which enters the trade channel and are consumed in the towns and cities by the urban families.

Since in 5,66,000 villages the grains are stored in indigenous storage structures, losses varying from 10-25 per cent in storage are encountered. In addition to physical losses, they are susceptible to deleterious changes brought out by moisture, mould, insect and rodents. The quality losses inflicted by these agencies, result in lowering of nutritional quality, biological value. Often the deteriorated grains are contaminated with toxic metabolites and pollutions, to which rural population has been found to be more exposed than the urban population. So far, organised effort has been made for developing processes for the storage of food grains in the warehouses and food processing plants in urban areas which constitute only 30 per cent of the total production. Therefore, there is an urgent need to develop and apply improved selective protectants and techniques suitable for application by untrained farmers for storage of foodgrains amounting to 75 million tonnes.

3. Objectives:

- i) To develop non-toxic grain protectant formulations for application by unskilled farmers with selective and safe indigenous products and to reduce the pollution due to organo-chlorinated and organo phosphorous compounds.
- ii) To substitute importation of persistent and hazardous pesticides such as aldrin, dieldrin, endrin, heptachlor and chlordane with less persistent and low toxicity new insecticidal components (X-factor) discovered at this Institute in Technical-BHC.

4.1 Nature of Investigation:

Applied

4.2 Classification:

Developmental Process &
Product Research.

4.3 Orientation:

Research & Development -
Augmenting food resources,
Wastage Utilisation,
Import substitution.

5.0 Period:

March 1972 to December 1974.

Discipline: Infestation Control &
Pesticides.

SUMMARY FOR PROJECT PROPOSAL

1. Project Title:

The development of insecticidal baits for household insect pests.

2. Justification:

The bait formulations for the control of household pests have not been so far developed in India. Therefore, preparation of baits based on indigenous materials would be economical and result in import substitution.

3. Objectives:

The increasing usage of insecticidal formulation such as sprays and dusts has been creating problems of residues in households, food processing plants, dairies, restaurants and confectionaries. The insecticidal residues are undesirable from the mammalian toxicity point of view and cannot be avoided unless the conventional methods of disinestation mentioned above are altered. Therefore, it is increasingly important to develop insecticidal baits which do not leave residues, for the effective control of insects in the residential and industrial establishments.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research/Product Research.

4.3 Oreintation: Import substitution.

5 Period: February 1972 to December 1973.

Discipline: Infestation Control &
Pesticides.

SUMMARY OF RESEARCH PROPOSAL

1. Project Title:

Studies on the combined effects of integrated rodent control measures and rural sanitation programme on rodent populations in selected villages.

2. Justification:

The recurrence of the damages and losses caused by rodents is a perpetual phenomenon in 100% rural habitats. It is recognised that it is high time to involve a strong agency to solve this problem in terms of long-lasting effects and to derive the benefits by sustained control measures. Integrated control measures standardized and applied in several villages previously (Project No.10/161) have, no doubt, shown the advantages and merits of such operations. But the cognisance of the factors influencing the rodent populations such as poor sanitation and hygienic conditions, sub-standard houses, improper food storage and handling, acceptance of rodent damage and losses, illiteracy, non-availability of scientific techniques and materials at a proper time, led to the evolution of the present project. Studies on rodent contamination and pollution in food, harbours and micro-organisms associated with several species of rodents (Project No.16/284) are supplementary to attack the problem of rural sanitation improvements. It is to raise the standards of health, food, living and well-being through the utilisation of the integrated application of chemical and sanitary measures in rural areas.

3. Objectives:

i) Determination of the presence and extent of rodent-borne disease; damage and loss-appraisal in foods and crops, abundance of rats and their ectoparasites; overall health and sanitation problems.

ii) Systematic and complete coverage of the areas; surveillance from the view point of storage; collection of garbage and disposal; rat proofing of existing establishments; and elimination of pest population. It is intended to obtain answers to the above problems by implementing the techniques evolved for rural situations in a more organised way. The present project has been formulated to initiate 'environmental control', through integrated application of rodent control measures, rodent-proofing, improved methods of food storage and handling. Another objective is to train more personnel in the villages who will be responsible for future programmes. It is envisaged to cover the entire village with dwellings and fields.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials, Process Research

4.3 Orientation: Welfare, conservation

5. Period: April 1972 to April 1974.

Discipline: Infestation Control &
Pesticides.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of clay mineral composition for improved functional properties of storage structures in rural areas.

2. Justification:

Although there are many types of rural traditional storage structures made of straw, bamboo, wood and mud, none of them is ideally suitable. Each one of them has one limitation or the other. Underground storage on the other hand causes mould growth in the grain and in some cases, total damage occurs due to water seepage. Even metal containers besides their limitations are also expensive. Therefore, it is proposed to develop a suitable mineralogical composition for the clay structure with all the advantages desired for the ideal storage container. It is envisaged to study the composition of different clays and their behaviour with salts and additives for their suitability as material for storage structure.

3. Objectives:

To develop storage structures of desirable shape and size for the storage of grain and other agricultural commodities in villages, so that the grain is stored till consumption without any quantitative loss and qualitative deterioration.

4.1 Nature of Investigation: Developmental.

4.2 Classification: Product Research.

4.3 Orientation: Raw material utilisation.

5. Period: January 1972 to April 1974.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilisation of millet (Maize, Jowar and Bajra) flours and their products for diversified food uses.

2. Justification:

As a result of increased production of millets (production for 1970 estimated at 21 million tonnes), a large surplus of maize and bajra is available unused in F.C.I. and commercial godowns. Finding more widespread edible uses for them is necessary not only for economic reasons but also to improve the nutritional status and diversification of the food habits of the population accustomed to rice and wheat. These millets have, however, to be suitably processed to make them more attractive, palatable and versatile.

3. Objectives:

i) Judicious refining of maize and bajra to make them acceptable to those people who do not use millets in their diet without serious loss of nutrients.

ii) Improvement of the nutritional quality of millets by processing and fortification with other protein sources.

iii) Production of nutritive flour blends using millets and other protein sources for conventional and newer type of food products.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process and Product Research.

4.3 Orientation: Raw material utilisation.

5. Period: April 1973 to March 1976.

Discipline: Rice & Pulse Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of methods and machinery for the economic milling of common pulses.

2. Justification:

Methods and machinery for the traditional processing of pulses (to dhals) are laborious, time consuming and outdated leading to 10-15% of avoidable losses. The losses are estimated to be over 1 million tons, costing about 150 crores of rupees annually.

3. Objectives:

To develop suitable and economic methods and machinery for the milling of common pulses like green gram, black gram and bengal gram and to scale up the new methods to commercial level.

4.1 Nature of Investigation: Applied

4.2 Classification: Process research/ design and fabrication.

4.3 Orientation: Development (Industrial & economic) and wastage minimization.

5. Period: August 1970 to July 1973.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Production of Ready Mixes for Sambar, Rasam, and Chakli type crispies for collection of costing data and test marketing studies.

2. Justification:

Increased urbanisation and industrialisation calls for convenience type food products, that save time, labour, etc. Ready-to-eat products are costly and need sophisticated packaging. Ready-mixes however, constitute an intermediate level of convenience products at moderate cost. These products are also of interest to Defence. Idli, Dosai, Vadai, Jelebi and Jamun developed earlier at the Institute have become popular, and are produced commercially. Laboratory investigations have been completed on instant mixes for South Indian style Rasam and Sambar and for two Chakli type crispies. Further work on commercialisation of the process for these mixes is necessary.

3. Objectives:

Production of mixes for Rasam, Sambar and two Chakli type crispies on a bench scale to collect costing data and make available sufficient material for test marketing studies.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product Research and Extension.

4.3 Orientation: Defence and Welfare.

5. Period: April 1972 to April 1974.

Discipline: Rice & Pulse Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effective use of solar heat and paddy husk for cost reduction in the mechanical and sun-drying of paddy.

2. Justification:

About 25 million tonnes of rice valued at Rs.25,000 million, are parboiled in India. Drying from 35% to 14% moisture is an essential step in this process. Drying is non-uniform in customary methods of sun-drying, mechanical drying using furnace oil as fuel is costly (about Rs.20-25/tonne). Further use of available solar energy as also the use of paddy husk as fuel for the furnace of the drier can make paddy drying cheaper. Providing a simple mechanical raker can make sundrying uniform.

3. Objectives:

- i) To make a suitable husk fired furnace with heat exchanger for heating air during paddy drying.
- ii) Concentrating and channelising radiant solar energy in the mill premises for heating the drying air.
- iii) To fabricate a simple mechanical raker for making sundrying quite uniform.

4.1 Nature of Investigation: Applied.

4.2 Classification: Design and fabrication and Process Research.

4.3 Orientation: Economic Development and Welfare.

5. Period: April 1972 to April 1975.

Discipline: Rice & Pulse Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardization of harvesting time, drying methodology and milling technology for village level processing of paddy.

2. Justification:

Rice milling and processing are being diverted increasingly for commercial operations to large complexes where modern technology can be utilised. However, more than 50% is consumed in the villages and is harvested, and processed by individual farmers on a small scale. Science and Technology utilised in the large modern mills have to be adopted to village level processing with a view to scaling down the operation without unduly sacrificing efficiency.

3. Objectives:

i) Developing simple methods for identifying the proper harvesting stage and for drying of paddy for minimising breakage.

ii) Developing a small scale rice mill with sheller, separator and polisher to suit village level handling and processing.

4.1 Nature of Investigation: Applied.

4.2 Classification: Design and fabrication.

4.3 Orientation: Economic Development and Welfare.

5. Period: April 1972 - April 1975.

SUMMARY OF THE PROJECT PROPOSAL

1. Project Title:

Standardisation of conditions for long term storage of robusta variety of banana for export.

2. Justification:

The production of bananas in India is about 12% of the total world production. Of the total export trade of bananas India's share is only 1%. So far only Dwarf Cavendish variety of bananas was being exported. The first crop of Robusta variety has been found to be more suitable for export than dwarf cavendish on consideration of size and compactness. It is necessary to carry out trials on first and second ratoon crops for standardizing conditions for harvesting, treating, transportation and storage.

3. Objectives:

To utilize Robusta variety for export.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process Research.

4.3 Orientation: Export promotion.

5. Period: April 1972 to March 1974.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of ethylene and/or hot water treatment on the ripening behaviour of slightly less mature mango fruit.

2. Justification:

Mango export trade is expected to reach 10,000 tonnes valued at 13 million rupees during 1975-76. In a bulk harvest the crop is an admixture consisting of various maturity grades. More mature fruits ripen quicker than the less mature fruits. If fruits are allowed longer on the tree there will be pre-harvest losses due to birds, monkeys, hail storms and gales. If the fruits are harvested earlier than full maturity and then subjected to less expensive, harmless and easy physical and chemical treatments it could result in uniform ripening. The preharvest losses and post-harvest decay can be reduced with the result the mango crop can be fully exploited for inland trade and export promotion. The Alphonso variety will be the subject of study in this Project.

3. Objectives:

i) To induce uniform ripening in slightly less than full mature mangoes to an acceptable standard by introducing practicable post-harvest treatments.

ii) Fixing standards for harvest, storage and transport.

iii) To apply the knowledge to other varieties of mango.

4.1 Nature of Investigation: Applied.

4.2 Classification: Materials research.

4.3 Orientation: Conservation and Export Promotion.

5. Period: March 1971 to December 1973.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies to improve the quality and shelf-life of monsoon coorg mandarins for fresh trade and processing.

2. Justification:

The total annual production of Coorg mandarins in Mysore State is 1,55,540 tonnes, of which monsoon crop contributes 60,000 tonnes. The monsoon crop besides being green in skin colour is reported to be high in acid content and low in brix. The fruit is highly susceptible to microbial spoilage and cannot be stored for more than 4-5 days at ambient temperature. It is estimated that approximately 30% of the total monsoon crop valued at 10.8 million rupees is lost due to fungal infection, fruit drop and improper handling practices. This enormous loss could be saved if the fruits are protected by pre or post-harvest treatments or by processing.

3. Objectives:

- i) To improve (a) fruit quality; (b) Storage quality and (c) processing quality.
- ii) To obtain better return for monsoon crop.

4.1 Nature of Investigation: Applied.

4.2 Classification: Material research and Process Research.

4.3 Orientation: Raw material and wastage utilization.

5. Period: February 1972 to March 1975.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Cultivation of Mushrooms for internal trade.

2. Justification:

Indian diet on an average is inadequate in protein rich foods. Mushrooms can supplement the diet to improve the nutritional requirements. The edible mushrooms grown under controlled scientific conditions on cheap organic materials may help us to produce a good source of protein. It helps us in getting more of foreign exchange to our country. In 1969, India exported 28 tonnes of canned mushrooms worth approximately Rs.3 million.

3. Objectives:

Objectives are to standardize the methods of cultivation of Pleurotus flabellatus on a large scale using various techniques. This mushroom has got attractive white colour, appearance and good taste with 30% protein on dry wt. basis.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product research.

4.3 Orientation: Raw material utilization.

5. Period January 1972 to Decr. 1973.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilization of indigenous tin plates and development of alternate containers and food lacquers.

2. Justification:

The entire quantity of tinplate (nearly 50,000 tonnes) required for the food processing industry is imported at present. Out of this nearly 15,000 tonnes are required for the fruit and vegetable processing industry and amounts to nearly 30 million rupees.

3. Objectives:

The objective is to find the suitability of indigenous tinplates (electrolytic) instead of the imported ones. Similarly it is desired to replace the lacquers imported from abroad with the lacquers prepared within the country.

4.1 Nature of Investigation: Applied.

4.2 Classification: Materials research.

4.3 Orientation: Import substitution.

5. Period: May 1972 - April 1975.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation and storage of mango pickles from acid, sub-acid and sweet varieties of mangoes at different stages of their growth.

2. Justification:

Pickle manufacture (65% of total fruits processed) and export (63% of foreign exchange on processed fruits) is an important activity of processed fruits and vegetables on small scale sector of industries. At present work has to be done on aspects bearing on colour, flavour and texture. Many enquiries are received every year especially on better methods of preparation and storage. This requires thorough investigation.

3. Objectives:

Suitability of different varieties of mangoes at different stages of their growth for production of pickles of better quality with regard to colour, flavour and texture are to be achieved. Enormous quantity of fruits which are so far wasted can be utilised.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product Research and Process
Research.

4.3 Orientation: Wastage utilisation and
Export Promotion.

5. Period: January 1972 to December 1974.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on extension of storage lives of apples, bananas, straw-berries and mushrooms by low dose gamma-irradiation mild refrigeration and combination treatments.

2. Justification:

Fruits and vegetables suffer a heavy loss on account of high incidence of infection, diseases and decay at ambient temperatures. The loss was estimated to be around 20-25 per cent of the total fruits and vegetables coming to markets. These commodities if allowed to remain in sound condition for a period of 10 to 15 days at ambient temperature during the glut and if wastage is kept below 3% the fresh trade will stand to gain considerably. This could be achieved by low doses of gamma rays plus other combination of treatments.

3. Objectives:

To prolong the storage lives of the commodities by low doses of gamma rays, mild refrigeration and other combination of treatments.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process Research.

4.3 Orientation: Conservation.

5. Period: March 1972 to February 1974.

Discipline: Fruit and Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on osmotic dehydration of fruits with special reference to mango, pineapple, jack fruit and apple.

2. Justification:

The present production of dehydrated fruit products is only 13 tonnes valued at 2.75 lakhs of rupees. Although these fruits could be canned successfully, the cost of tinsplate due to import supply, high cost of production, make the canned product prohibitive. Any dehydrated product will be cheaper in terms of canned product as there will be saving of 86% by shipping, 77% in storage, 82% in handling cost and about 80% in packaging cost. From these considerations and from the climatic conditions prevailing in the country there is great scope for dehydrated product. The demand for dehydrated fruits in the Defence Services is likely to increase very significantly in the years to come. Osmotically dehydrated fruit is reported to give a product which will be comparatively cheaper and very near to natural fruit from colour, flavour and texture point of view.

3. Objectives:

- i) To produce dehydrated fruits of good quality which will be very near to natural fruit from the point of view of colour, flavour and texture.
- ii) To find new outlet for seasonal surplus and wastage utilisation.
- iii) To meet the Defence requirements of dehydrated and concentrated fruit products.
- iv) To provide comparatively cheaper processed product.
- v) To improve export market for indigenous fruits by developing new and more acceptable products.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process and Product Research.

4.3 Orientation: Wastage utilisation and
Export Promotion.

5. Period: January 1972 to March 1975.

Discipline: Flour Milling and Baking
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the technology of fortification of cereals and their products specially baked products with proteins, essential amino acids, vitamins and minerals.

2. Justification:

The Indian population (86%) is dependent on cereals and cereal products as their main source of protein, vitamins and minerals. Milling of wheat into flour for white bread and biscuits has been found to suffer heavy losses (about 50%) of vitamins, minerals and protein quality is also seriously depleted. Modern Bakery is keenly interested in high protein breads whereas the high protein biscuit industries have yet to develop. The ordinary biscuit hardly contains 5% protein.

3. Objectives:

The results will be useful in formulating a national programme of fortification of cereals and cereal products. Information on the basic status of milled products of the indigenous cereals and on the technological feasibility as shown by stability and improvement in the quality of fortified products is to be obtained for achieving this objective.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process and Product Research.

4.3 Orientation: Welfare

5. Period: January 1972 to January 1974

Discipline:Flour Milling and
Baking Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

To investigate the use of maize for malt extract.

2. Justification:

The successful cultivation of maize in South, particularly Mysore State has created a problem of its effective utilisation at remunerative prices to the grower. Its use for malting as such or in conjunction with barley malt offers economic possibilities in view of the high cost of barley transported from North.

3. Objectives:

To develop malt extract agro-industry based on maize in areas where it is cheaper.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product research.

4.3 Orientation: Raw material utilisation.

5. Period: January 1972 to January 1974.

Discipline: Flour Milling &
Baking Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the milling, baking and associated characteristics of Indian wheats as influenced by the varietal and environmental conditions.

2. Justification:

The utilisation of Indian wheat by the flour milling and industries, to eliminate imports is of great importance to the national grain economy of the country. The production of wheat in 1971 is estimated at 23 million tons. The introduction of new high yielding varieties has resulted in the availability of many wheats with unknown milling and baking qualities. Considering the modern bread programmes and traditional baking, these qualities have an impact on the producer, consumer and user industry.

3. Objectives:

To obtain basic information regarding the effects of variety, and environment on the milling, baking and associated characteristics of commercially valuable properties of wheat in order to devise appropriate treatments for improving their performance for milling and baking.

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|-----|---------------------------------|----------------------------|
| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Product research |
| 4.3 | <u>Orientation:</u> | Raw material utilisation |
| 5. | <u>Period:</u> | January 1972 to March 1974 |

Discipline: Flour Milling and
Baking Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the baking, rheological and associated compositional factors of Indian roller milled commercial flours and by-products

2. Justification:

There are about 209 roller flour mills, with an installed capacity of 5 million tons. The use of indigenous wheats for production of good quality flour for the fast expanding bakery industry is of great economic importance for self-reliance on our own resources of wheat

3. Objectives:

To improve milling of indigenous wheats by the industry for production of flour of improved baking characteristics.

4.1 Nature of investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Indigenous wheat utilisation

5. Period: March 1972 to March 1974

Discipline: Industrial Research
Consultancy & Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Egg Albumen Flakes

2. Justification:

The country's entire requirement of albumen flakes (4 tons approx.) are imported annually. A preliminary survey carried out by INSDOC, Bangalore has placed the requirements of albumen flakes around 500 quintals per annum. The know-how for the manufacture has already been released through NRDC for small scale production to M/s. Radiant Industrial & Commercial Co., Bombay. Requests for upscaling are to be attended to.

3. Objectives:

Introduction of mechanisation in the process and translation of laboratory know-how to the industry with a view to improve the quality and yield.

4.1. Nature of investigation: Applied

4.2. Classification: Design, fabrication,
Consultancy and extension

4.3. Orientation: Import substitution

5. Period: January 1972 to January 1974

Discipline: Industrial Research
Consultancy & Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of rural snacks with high nutritive value

2. Justification:

Low fat jaggery based sweets using sesame (Revadi), Bengal gram dal (Chikki) groundnut and puffed rice are popular cottage scale industries, both in rural and urban areas. The first three are nutritious and economical. Although they are made all over the country, their quality varies with local expertise of making them. Improved sweets with the best possible flavour from the ingredients used would be an inexpensive item for consumption by children, compared to chocolates and toffees (with lesser nutritive value).

3. Objectives:

To streamline and standardise the recipes of these four, beginning with chikki. This would lead to (i) quality product, (ii) availability of nutritious and less expensive sweets for child consumer in rural areas, and (iii) wider internal market after scaling up production lines.

4.1 Nature of investigation: Applied

4.2 Classification: Consultancy & Extension

4.3 Orientation: Welfare

5. Period: April 1972 to July 1973

Discipline: Industrial Research
Consultancy & Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on solvent extraction for obtaining toxin-free meal and oil from groundnuts

2. Justification:

Groundnut is an important foreign exchange earning crop among the oilseeds produced in our country. The foreign exchange earnings due to export of groundnut products alone were about 40 crores of rupees (1966-67) which is about 75% of the export earnings from oilseeds. Aflatoxin contamination in peanuts poses a serious problem as it might not only affect our export trade, but also its utilisation in the country for human consumption in the country. Studies have shown that A.flavus is a common contaminant in groundnut cake samples from Bombay Docks. There have been cases in which the groundnut exports were held up in docks as these were declared toxic. Hence there is a need for the development of processes for detoxification suitable for large scale operation.

3. Objectives:

Development of a solvent extraction process for detoxification using mixture of solvents (indigenously available) and the suitability of the solvent system for the extraction of fat etc.

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| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Process research |
| 4.3 | <u>Orientation:</u> | Export promotion/Welfare |
| 5. | <u>Period:</u> | March 1972 to December 1975 |

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Coffee and Tea Milk Substitutes and Dehydrated
Miltone

2. Justification:

Surveys carried out by the National Dairy Development Board have indicated that about 40% of the milk consumed in a house-hold goes for coffee and tea. In many developed countries, coffee and tea whiteners are used in place of milk. Since milk is very much in short supply in India and is needed for children and vulnerable groups, there is an urgent need to develop milk substitutes for coffee and tea utilising non-dairy products. Purified vegetable proteins can be used for this purpose.

3. Objectives:

The objective is to produce an acceptable milk substitute for coffee and tea. Milk substitutes produced in other countries are very low in protein. The object here is to produce a milk substitute, based on vegetable protein.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Other substitution/Welfare

5. Period: January 1972 to March 1974

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation and evaluation of weaning foods

2. Justification:

The type of foods for weaned children presently used are based on farinaceous materials deficient in protein. There is thus an urgent need for developing weaning foods with balanced composition and high nutritive value based on available raw materials.

3. Objectives:

1. Large scale commercial development of weaning foods based on groundnut flour/groundnut protein isolate, soyabean flour, pulses and cereals on which laboratory work has been completed.
2. Bench and experimental scale studies on the development of weaning foods incorporating newly available protein rich raw materials such as sesame meal, cottonseed flour, guar meal and other sources such as rice bran, wheat, germ, etc.

4.1 Nature of Investigation: Applied

4.2 Classification: Product/Process Research

4.3 Orientation: Raw material utilisation/
Welfare

5. Period: January 1972 to March 1974

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of edible quality protein concentrate from mustard seed.

2. Justification:

Mustard seed is the second major oil seed crop of India with the annual production of 1.4 million tons. The commercial cake has limited use as it contains pungent, bitter and toxic principles. The protein quality is, however, comparable to milk proteins. There is scope for better utilisation of mustard cake proteins through suitable processing and elimination of undesirable constituents.

3. Objectives:

1. Process development work on the production of bland mustard flour and protein concentrates.
2. Utilisation of edible mustard flour in processed foods

4.1 Nature of investigation: Applied

4.2 Classification: Process/Product Research

4.3 Orientation: Raw material utilisation

5. Period: January 1972 to March 1974

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process development studies on the benefication and detoxification of commercial guar meal and on dehulling of guar seed

2. Justification:

India produces 500,000 tonnes of guar seed which is processed for the galactomannan gum. Export earnings from gum amount to 2 million rupees per year. The protein-rich by-product, guar meal, needs benefication and detoxification. By such processing, gum recoveries can be improved and the meal used in feeds and foods. This will modernise the industry and bring greater returns on capital investment.

3. Objectives:

1. Scaling up of laboratory processes for the benefication and detoxification of guar meal.
2. Development of improved techniques of dehulling the seed.

4.1 Nature of investigation: Applied

4.2 Classification: Process/Product Research

4.3 Orientation: Wastage/Raw material utilisation

5. Period: January 1972 to March 1974

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process development studies on the production of soyabean flours and protein products and their utilisation

2. Justification:

Soyabean is being introduced as a commercial agricultural crop in the country. A centrally sponsored scheme is being implemented to extend the area under soyabean to 400,000 hectares by 1973-74 with a production target of 500,000 tonnes. The Government have stressed the need to develop appropriate technology for processing soyabean and its utilisation in foods and feeds.

3. Objectives:

1. Process development work on different grades of soy flours, protein concentrates and isolates.
2. Utilisation of these in processed protein food mixtures, snacks and beverages.
3. Scale up of processes with complete indigenous technical know-how.

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| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Process/Product Research |
| 4.3 | <u>Orientation:</u> | Import substitution/
raw material utilisation |
| 5. | <u>Period:</u> | January 1972 to March 1974 |

Discipline: Microbiology, Fermentation
Technology and Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Fermented Beverages - Fruit wines & Brandies

2. Justification:

About 2,00,000 tons of grapes and 3,00,000 tons of cashew apple fruits are available in the country. One winery and two distilleries are being established with the technical 'know-how' developed in CFTRI. Another 5 units are likely to come up in the coming years. Utilisation of waste material like cashew apple and surplus grapes will help in developing the fermented beverage industry and possibilities of export.

3. Objectives:

1. Prevention of turbidity in wine.
2. Standardisation of conditions for distillation of quality brandy

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Raw material utilisation

5. Period: April 1972 to March 1976

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of toddy

2. Justification:

The excise revenue from toddy in Mysore State alone is over Rs. 15 crores. A product bringing substantial revenue to the State needs modernisation in technique of production. Toddy has an edge over other alcoholic beverages as this raw material is not used as food.

3. Objectives:

1. To study microbiological and chemical changes that occur in neera until it becomes toddy.
2. To isolate a good alcoholic fermenter which can be used as a starter culture.
3. To lay down standards for toddy after collection of data.
4. To standardise processing conditions for bottled toddy.

4.1 Nature of investigation: Applied

4.2 Classification: Process research

4.3 Orientation: Welfare and wastage utilisation

5. Period: October 1971 to
October 1973

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of spent brewer's and distiller's yeast for food and feed purposes.

2. Justification:

In view of the protein shortage in the country, it will be desirable to explore the possibility of utilising the breweries and distilleries wastes which amount to approximately 24,000 kg. per annum. The processing would involve debittering. This would help the country to save as well as to earn foreign exchange.

3. Objectives:

Processing of spent brewer's and distiller's yeast to improve its quality by removal of bitter taste and flavour for food and pharmaceutical purposes.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Wastage utilization

5. Period: April 1973 to March 1978

Discipline: Microbiology, Fermentation
Technology and Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Manufacture of Instant Dahi from Miltone

2. Justification:

The quantity of milk used for making dahi for direct consumption is estimated at 359 million gallons or 9.1% of the total milk production. The production of milk in India is estimated to be 23 million tons which is inadequate even to meet the minimum per capita requirement of fluid milk. To stretch the availability of milk supply, C.F.T.R.I., has prepared miltone (vegetable toned milk). The use of miltone for dahi manufacture would make milk available for more essential needs. The quality of dahi prepared commercially is far from satisfactory with seasonal and regional variations. Manufacture of an instant dahi from miltone will ensure the availability of a wholesome and standard quality product.

3. Objectives:

Preparation and popularisation of instant dahi

4.1 Nature of investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Milk substitution

5. Period: April 1973 to March 1975

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

(M-18/273) Microbiological quality control of
cashewnut, spices and curry powders.
(current upto December, 1972)

2. Justification:

Cashew, spices and curry powders earn valuable foreign exchange (spices 34 crores and cashew 30 crores of rupees). At present, our country has a big stage in the international trade of these commodities. Several of the importing countries have well defined microbiological standards for cashew and spices. There is also competition from other producing countries. Unless our products meet the quality specifications of importing countries, the country may loose the international market. It is, therefore, very essential to introduce strict microbiological quality control for export promotion of cashew and spices.

3. Objectives:

Survey of the incidence and types of microflora in cashew and spices from different regions of the country and formulation of suitable microbiological standards.

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| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Product Research |
| 4.3 | <u>Orientation:</u> | Export promotion |
| 5. | <u>Period:</u> | January 1972 to Dec. 1972 |

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardization of heat processing for -

- (a) Jamuns and similar products
- (b) Canned and cured meat products

2. Justification:

(a) Total production of processed meat products expected to go up to 10,000 tons per annum by the end of IV Plan period. Microbiological quality of meat products indicated over processing resulting in loss of organoleptic qualities of the product. Hence, there is a need for standardizing adequate processing of meat products which will prevent spoilage due to bacteria maintaining at the same time organoleptic qualities of the products.

(b) Jamuns and Rasogollas are low acid protein products packed in sugar syrup, and as such require heat processing to destroy the potential spoilage organism. The heat processing given should also preserve the delicate texture and shape of the product.

3. Objectives:

To standardise heat processing for -

- (a) Mutton Keema curry and mutton chunk curry
- (b) Jamuns and Rasogollas

4.1 Nature of investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Export promotion

5. Period: April 1972 to March 1973

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Microbiological studies on traditional Indian
confectionaries - sweets and savoury preparations

2. Justification:

Many kinds of traditional Indian confectionaries - sweets and savoury preparations are being manufactured in the country. Some quantity of it is also being exported. A recent microbiological quality studies of these traditional Indian sweets indicated 47% of the samples carried enteropathogenic bacteria. Hence there is a need to study the microbiological quality of these Indian sweets and savoury preparations so that the problem of pollution and health hazard likely to be caused by these products may be eliminated and also these industries can produce better quality products so that the volume of the export trade can be increased.

3. Objectives:

The main objective is to study the microbiological quality of traditional Indian sweets and savoury preparations so that the Industry can manufacture products of better quality having longer shelf life.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Export promotion

5. Period: April 1973 to March 1976

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Research on problems relating to malting and brewing industry in India

2. Justification:

7.5 lakh litres of beer are produced annually. The agro-based industry, is importing hops, enzymes, and yeast. To make the country self-reliant, a nucleus is very essential to study the various problems connected with the industry.

3. Objectives:

1. Maintenance and supply of bulk wet yeast to breweries (Import Substitution)
2. To study the suitability of hops grown in our country (Import substitution)
3. Modernisation of brewing industry utilising cheaper carbohydrate source and enzymes of bacterial or fungal origin
4. Develop better strains of yeast for fermentation
5. To aid entrepreneurs in establishing breweries

4.1 Nature of investigation: Applied and Developmental

4.2 Classification: Process Research

4.3 Orientation: Development and import substitution

5. Period: April 1973 to March 1978

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Developmental work relating to the production of fungal enzymes used in food industries

2. Justification:

India imports annually 1 crore of rupees worth of microbial enzymes for use in food and pharmaceutical industries. It is, therefore, desirable that the 'know-how' for their development should be developed in India. This will also help import substitution.

3. Objectives:

To develop processes for the production of fungal enzymes and their application in various aspects of food processing.

4.1 Nature of investigation: Applied

4.2 Classification: Materials and Process
Research

4.3 Orientation: Import substitution and
export oriented

5. Period: April 1972 to March 1974

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Micro-algal culture and cultivation of micro-algae as source of protein as a dietary protein supplement for food and feed purposes

2. Justification:

Micro-algal culture is potentially a more productive use of land for protein than in conventional agriculture. A ten-fold or a greater potential saving of water is indicated as compared to conventional agriculture. Under optimal conditions algae will yield 7000 gms. protein/meter²/year as compared to 150 gms. for a good crop of wheat or maize. The protein content of algae is considerably higher than that of terrestrial plants including legumes.

3. Objectives:

Algal technology and micro-algal cultivation in open air conditions as a source of protein, chemical constituents, clinical and nutritional properties, algal protein evaluation as a dietary protein supplement for feed and food purposes, providing adequate cheap protein for the population

4.1 Nature of investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Wastage utilisation

5. Period: May 1972 to May 1975

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1.0 Project title:

Production of meat tenderizers

2. Justification:

Total production of meat is about 554 thousand tonnes annually but a fair percentage of this meat is hard in texture due to age of the birds and animals or due to breed species, etc. Many a times, we resort to eviscerated birds or chunks of meat with emulsion from raw papaya or with curds. This is a laborious and time consuming method. Quite a few catering houses resort to use of enzymatic preparations from abroad. It would, therefore, be worthwhile if a suitable meat tenderizer is locally prepared and marketed to meet the demand of the industry. Since there is actually no production of the product, it is difficult to assess the exact demand for this product but the fact remains that there is an urgent need and likelihood of good demand for this type of product.

3. Objectives:

To standardise conditions for preparation of tenderizer in a powder form made from enzymes and salts either separately or in combination. Adjustment of optimum conditions such as pH, temperature and time for concentration purpose to maintain high enzymatic activity. To work out costs and design of blue print for the industry.

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| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Process/Product Research |
| 4.3 | <u>Orientation:</u> | Quality Improvement |
| 5. | <u>Period:</u> | April, 1972 to March, 1974 |

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on boiled and smoked products from oil sardine, mackerel and small sized shrimp

2. Justification:

Of the total catch of about 1.5 million tons of fish, oil sardine, mackerel and small sized prawns (shrimp) form nearly 30 per cent of this catch. Due to lack of refrigeration and cold-storage facilities, a fair percentage (about 50%) of these fish is not properly utilized. This study, therefore, envisages proper utilization of the fish by resorting to boiling and smoking processes. Such studies are necessary because such a nutritious food is being wasted when there is acute shortage of good quality protein in our diets. By conserving the available sources of fish and its effective utilization, we can overcome malnutrition in our country. The process being cheap and simple in operation could be initiated on cottage scale.

3. Objectives:

These processed products are likely to find ready market as they are tasty. There is also likelihood of exporting these to places like Ceylon, Burma, etc. where there is demand for smoked and dried products. The approach will be on the following lines;

- (1) Improvement and standardization of the methods of preparing boiled and smoked fishery products
- (2) Development of a procedure for assessing the quality of these processed fish to prevent health hazards.
- (3) Development of suitable packing materials for storing these products under different environmental conditions.
- (4) Detection of nitroso-amines and methods to be followed to see that the level does not increase the upper limits.

4.1 Nature of investigation: Applied

4.2 Classification: Material/Product/Process Research

4.3 Orientation: Quality improvement, Export Promotion

5. Period: April, 1972 to March, 1974

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preservation of Cured Meat Products by smoking

2. Justification:

The processed meat (ham, bacon, sausages, canned meat, etc.) was at a level of 3,000 tonnes in 1965 and is targetted to reach more than 10,000 tonnes by the end of the IV Plan. Now it is about 7,000 tonnes. Of this total more than half consists of smoked cured products. Comminuted type of products form about 20%. A similar proportion consists of canned products. Cured and smoked products, because of their acquired stability against spoilage, are more suitable for storage, distribution, display and sale in unit packages.

3. Objectives:

The technology of production of ham, bacon, sausages, etc. is well known. The quality and acceptability of the product depends on the nature and extent of smoking. The preservation property of the smoke depends on the smoke constituents. Smoke constituents deposited on the product depend on the type of wood, temperature of smoke generation and environmental conditions in the smoke house. As a result of work on these lines, the quality of smoked meat products would improve. This would result in increased production and help establish the meat product industry on sound lines to produce a variety of meat products.

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| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Glassification:</u> | Materials Research,
Process Research |
| 4.3 | <u>Orientation:</u> | Development of meat
industry |
| 5. | <u>Period:</u> | April, 72 to March, 75 |

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation of immersion freezing of meat

2. Justification:

Export statistics of chilled and/or frozen meats from India are confined mainly to sheep and lamb, poultry, frog legs, bovine meat and other meats like buffalo, camel, horse, tortoise, etc. The total exports show a decline. It was 1300 tonnes in 1962-63 and has fallen to 950 tonnes in 1969-70. According to the Directorate of Technical Development, currently the exports are confined to the frozen variety for which there is a potential market in the Middle East and South East Asian Countries. The quality of frozen meat depends not only on the raw material but also on the rate of freezing. Immersion freezing can give fast rates of freezing and is applicable to irregular shaped cuts of meat.

3. Objectives:

To adapt block ice making plants, to immersion freezing of meat within the time limit specified for fast freezing. The results of this project would help in stabilizing and increasing the frozen meat exports to Middle East and South East Asian Countries.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Export Promotion/Development

5. Period: April, 72 to March, 74

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of Sausage Casings in a Semi-dry condition

2. Justification:

A large quantity of salted casings are exported. The proportion of sheep and goat intestines processed into salted casings for export has been 7% for the last decade. In the case of cattle casings, the utilization is far better and is 63%. But the rate for salted sheep and goat casings has been Rs.80/- kg. while that for cattle casing is Rs.35/-. The export of salted casing of the two types has realised Rs.107 lakhs and Rs.76 lakhs respectively per year. During the meeting between representatives of Japan Sheep Casing Importers Association and Salted Casing Manufacturers of India in the Ministry of Foreign Trade and subsequently in the Department of Agriculture, it was pointed out that Japan used to import about 40% of their requirement from India and it has fallen to 20% because of quality differences in casings from India. The deficiencies are (i) adequate water supply; (ii) presence of fat and slime; (iii) dull colour (iv) non-uniformity in calibration and (v) inadequate salting. Therefore, the quality of casings for export has to be improved to be competitive in international market.

3. Objectives:

To improve the quality of the casing exported by using processing aids during stripping and sliming, moisturiser and antibacterial additives during the salting and introduce suitable rollers for stripping and sliming. Use of rollers for stripping and sliming in conjunction with processing aids would result in casings of uniform clean quality and also in economy of water. This would ensure recovery of the lost export market and possibly improvement.

4.1 Nature of investigation: Applied

4.2 Classification: Byproduct utilisation

4.3 Orientation: Export promotion/quality improvement

5. Period: April, 73 to March, 76

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on various aspects of handling fresh water fish for marketing in fresh state

2. Justification:

A field survey conducted by CFTRI on the transportation and marketing of fresh fish in India showed that (i) 25-50% of fish reaching destination become sub-standard; (ii) the sub-standard fish fetch only 50% of the price of standard fish; (iii) in Calcutta alone, it is estimated that there is a minimum loss of Rs.25,000/- per day to the industry as a whole; (iv) these losses are entirely due to defects in the methods of handling, type of containers used and mode of transport. Stress was laid on fresh water fish because about 80% of the 50,000 tons of fresh fish annually transported by rail in India belong to inland species. The following figures predict further increase: (i) there has been nearly 50% rise in production during the last decade (from 3,09,000 tonnes in 1958 to 4,50,000 tons in 1968); (ii) only a fraction of culturable water area (0.61 m. hectares out of 1.62 m. hectares available) has been utilized so far; (iii) the outlay for seed production in IV plan (Rs.354.46 lakhs) is more than twice that for III Plan (159.45 lakhs).

Literature survey revealed that the information regarding the spoilage aspects of fresh water fish is scanty. India being largest producer of fresh water fish in the tropical area, we have to give more emphasis in the chilling and packaging of these varieties. Work so far carried out by us reveal that there is considerable difference in the biochemical nature of the fish and associated bacterial flora responsible for spoilage, from those of marine fish.

3. Objectives:

(i) to collect basic data regarding different biochemical and bacteriological aspects of spoilage of commercially important fresh water species; (ii) to work out ideal conditions of storage and packaging to ensure minimum spoilage; (iii) to investigate physico-chemical aspects of chilling on a quantitative basis; (iv) to develop reliable objective methods to assess quality to

Facilitate quick inspection (v) to study the commercial possibility of marketing fillets; and (vi) to ensure hygiene in marketing of fresh fish

- 4.1 Nature of Investigation: Applied
- 4.2 Classification: Process Research
- 4.3 Orientation: Conservation
5. Period: July, 1972 to March, 1975

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on Tanduri Chicken

2. Justification:

Poultry industry has made rapid strides during the last decade and today the production of poultry meat in the country is about 80 million kgs. Leaving aside a margin of 15% of poultry which die due to various diseases, we are left with another 198 million birds (poultry population is taken as 234 million) which go at certain stage or other for table use. On an average, if each bird yields about 750 gms. of meat, then the total amount of chicken meat available in the country should not be less than 150 million kgs. This projects a picture of deficit of 70 million kgs. of meat which can be attributed to the losses during processing, preservation, transport and distribution.

At present 70% of our rural as well as urban population are non-vegetarians in nature. People living in the city and industrial areas would definitely show preference for ready to eat, heat and serve poultry items if made available to them in a convenient form. Out of these various ready to eat items, Tanduri chicken is getting popular, since it is widely accepted in different parts of the country including middle east countries.

3. Objectives:

Preliminary studies at CFTRI has shown that Tanduri chicken packed in polyethylene bags could be stored for 14 days at display cabinet temperature (40°F) without affecting much the chemical, microbial and organoleptic characteristics. However, detailed studies should be carried out to standardise methods for production, storage and packaging. If the keeping quality could be improved under the ambient conditions with proper packaging, the losses during distribution may be minimised.

4.1 Nature of investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Conservation

5. Period: April, 1972 to March, 1975

Discipline: Meat, Fish and Poultry
Technology

1. Project Title:

Studies on shell egg quality as influenced by season, age and strain of birds and under storage conditions

2. Justification:

The vast population of the under-developed nations are suffering from malnutrition and are prone to many diseases. Poultry and egg have been shown to be most acceptable means of rapidly increasing protein levels of substandard diet. The poultry population in India in 1961 was 116.9 millions and proposed target for 1977 is 940.4 millions. In the IV Plan and V Plan period 40 and 97 eggs respectively per capita annually has been proposed for the egg consuming population. Poultry and eggs contribute Rs.669.1 million to the total value of Rs.15,927.2 million from live stock and live stock contribute 11.83 per cent of total income of India.

The quality of shell eggs available to consumer is an important factor in determining the level of internal consumption and also export to overseas market. The loss due to deterioration of egg quality is about Rs.56 million annually. The import of high quality egg laying stock from abroad has been the most important factor responsible for the success of commercial poultry production in India. In recent years, there has been surplus stock of eggs in summer as well as some other seasons of the year requiring storage for some months. Reports are controversial on the effect of storage at different temperatures on the decline of egg quality among different strains of egg production fowls.

Systematic work needs to be done in our country to study shell egg quality during production and storage. Results of work done on the above lines for quality of egg cannot be applied to our conditions as the climatic condition, feeding, management and environment, breeds of chicken are not the same. As such, initial quality of eggs and its subsequent decline under storage conditions are to be studied systematically in order to enable the expanding egg industry for quality control programme.

3. Objectives:

To assess the quality of eggs produced by different strains of birds, variation due to season and age.
To study inherent difference in keeping quality of eggs.

Measure rate of decline under short and extended period of storage. To study functional properties, palatability and consumer acceptance for stored eggs. To suggest method of preventing decline in quality of eggs offered for sale for local consumption and for export market. To prevent the economic loss and health hazards due to deteriorated egg quality.

- 4.1 Nature of Investigation: Applied
- 4.2 Classification: Product Research
- 4.3 Orientation: Export Promotion
- 5. Period: April, 1972 to March, 1975

Discipline: Meat, Fish and
Poultry Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

- Effects of restricted feeding on the performance and qualitative and quantitative carcass characteristics of broiler chicken

2. Justification:

The import of high quality broiler stock from abroad has been the most important factor responsible for success of commercial broiler production in our country in recent years. It is also a matter of great satisfaction that ICAR has taken timely steps in sponsoring a large scale project on broiler breeding. At present, per capita consumption of poultry meat in India is only 131 g whereas in developed countries, it is upto 13.18 kg and it is hoped that our consumption will increase.

Economic broiler production with desirable carcass quality under conditions prevailing in India is a problem which has been bothering the minds of broilerman. Many countries have evolved systems by which fairly high level of meat production and carcass quality is obtained from broiler stock. Since feed cost constitutes major cost of producing quality poultry meat, it is important that considerable research should be focussed on improving the feed efficiency and carcass quality. Work at CFTRI indicate that a feed efficiency of 2.5 kg of feed per kg. gain in live weight would be achieved in about 8 weeks with good carcass quality. However, further studies should be carried out to bring down feed utilization without affecting the growth, organoleptic and carcass characteristics of broiler meat. This is very important as many farmers have still doubt about the profit from broilers as feed cost constitutes major cost of producing good quality poultry meat.

3. Objectives:

The purpose of this investigation is to evaluate the use of restricted diet for economic broiler meat production without loss in carcass quality and thus help the broiler industry.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Conservation

5. Period: March, 1972 to March, 1974

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Experimental studies on the preparation of Dehydrated Meat containing varying proportions of vegetable protein /

2. Justification:

The present annual production of meat in India is of the order of 0.6 million tonnes, but its price is far too high to be within the reach of the vast majority of the vulnerable sections of the population who need it most.

One of the most acceptable forms of processed meat is dehydrated mince. It is possible to prepare high quality dehydrated meat mince even by conventional hot air dehydration. However, the product at Rs.40-45 per kg. is far too costly even for Defence. At the instance of Defence, laboratory studies have successfully been concluded at the Institute on the preparation of dehydrated meat containing 50% vegetable protein (groundnut protein isolate) and the product has been found to compare well with whole dehydrated meat in organoleptic quality, at the price of Rs.25/- per kg. There are a number of problems connected with the large scale production of the product from the angle of extrusion, cutting, cooking and dehydration. Hence, the need for carrying out bench scale and pilot plant trials with a view to deciding upon the equipment to be used.

3. Objectives:

To carry out experimental studies on the preparation of dehydrated meat containing varying proportions of vegetable protein with a view to collecting data for scaling up, costing and also proper packaging.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Defence/Conservation

5. Period: July, 1972 to December, 1974

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Accelerated simulation of vibration hazards on packaged foodstuffs.

2. Justification:

The vibration test is an important one in the assessment of transport-worthiness of a package. The vibration hazard is simulated on a convention based on actual experiments conducted by M/s LAB Corporation, USA and accepted by the U.S. National Safe-transit Committee and is being followed all over the world. This does not take into consideration the variations in the characteristics of vibration during transit which depends upon the speed, the condition of carriage springs and the rail track or the road. The characteristics of vibration in India are different from those, based on which the original experimental conditions were devised. Hence, the test schedule does not apply to our conditions. (one hour vibration at 1 g to simulate 1000 miles of rail journey is the current practice).

The work envisaged in the project aims at studying the effect of vibrations on packaged foodstuffs and aims at how best to simulate a given vibration conditions in an accelerated way in the laboratory. This will facilitate fixing the test schedule to stimulate given type of vibrations encountered in a journey and thus helping in evaluating the packages for their transport-worthiness.

3. Objectives:

The current test procedure on the vibration test, one of the three important tests to decide the ability of packages to withstand journey hazards, do not take into account the nature of the packaged product and in some instances the conditions of the tests are felt to be too severe. The present project is taken up mainly to study the relationship of vibration parameters, i.e. frequency and amplitude to the product damage. This would help in better simulation of the vibration hazard in the laboratory simulation of journey hazard tests and in the development of better package test methods.

4.1 Nature of Investigation: Applied

4.2 Classification: Developmental

4.3 Orientation: Development

5. Period: Jan. 1970 to Oct. 1972

Discipline: Process Development &
Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on prepackaging and storage of fresh fruits and vegetables in (i) unit plastic containers (bags); (ii) bulk containers lined with plastic films, under different atmospheric conditions prevailing in the consuming areas.

2. Justification:

Out of the estimated 18 million tons of fruits and vegetables produced in the country, less than 1% is utilised by the processing industries and the rest is consumed in rural and urban areas. It is estimated that about 15-20% of it is spoiled due to faulty methods of packaging, transportation and handling. Some agencies have estimated this loss to be as high as 30%. Under the existing practices of merchandising, the fresh produce is sold unpackaged and under uncontrolled atmospheric conditions. In addition, at many markets, adequate cold storage facilities are not available to store the unsold produce at the end of the day. The above conditions result in heavy physiological losses in weight, loss of freshness, vitamins in some cases etc. In addition, the produce gets injured physically while handling during sale and thus gets pre-disposed for microbial spoilage. These defects to a great extent are responsible for reducing the 'shelf-life' of produce during sale. To avoid these difficulties, the retailer prefers to sell away the remaining produce at the end of the day for comparatively lesser prices.

Prepackaging of fresh produce in appropriate packages like (i) plastic film bags or paper trays wrapped with suitable plastic films, etc. and (ii) by storing the unsold commodity at the end of the day in bulk, in suitable containers provided with plastic film liners, reduce the rapid rate of physiological losses in weight and minimise the mechanical injury to the fresh produce. As a consequence of these the shelf-life of the produce is extended considerably resulting in higher economic returns to the retailer and supply of quality produce assured to the consumers under hygienic conditions.

3. Objectives:

(a) To extend the shelf-life of the fresh produce by prepackaging and storing them at room temperature

(b) To find the effect of pretreatments like skin coating and washing in water with and without fungicide, etc. prior to packaging on the 'shelf-life' of the prepackaged produce.

(c) To study the effect of different types of liners in individual shipping container or over-wrapping the palletted loads on the storage life of perishables under climatic conditions generally prevailing both at growing and consuming centres.

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|-----|---------------------------------|--------------------------------|
| 4.1 | <u>Nature of investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Product Research/
Extension |
| 4.3 | <u>Orientation:</u> | Conservation |
| 5. | <u>Period:</u> | January, 1970 to January, 1973 |

Discipline: Process Development and
Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Gas and skin packaging of Bananas for Export
Trade

2. Justification:

About 20 thousand tonnes of bananas are exported every year to Middle East. Efforts are being made to export further quantities to USSR and Japan. During 1965 and 1966 the quantity exported to USSR was about 6,000 tonnes and during 1967 to Japan was about 1,000 tonnes. This was possible as the journey time is below 15 days. Due to the closure of the Suez Canal, the journey to USSR is round the Cape of Good Hope which increases the journey time to more than a month. As the fruits with the present packaging and refrigerated condition perish within that period, the export to USSR has come to a standstill. If the objectives of the project in developing packaging methods to prolong the storage life of bananas to meet the requirements are achieved, the export of bananas to USSR and other European countries can be revived.

3. Objectives:

Development of flexible film packages for automatic controlling atmosphere at the desired level in the package to extend storage life and Development of skin packaging techniques for preventing the bruising and detachment of fingers from the banana hand.

4.1 Nature of investigation: Applied

4.2 Classification: Designing

4.3 Orientation: Export Promotion

5. Period: July 1970 to December, 1972

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Methods to optimise size, number and distribution of ventilation holes for flexible film bags intended for prepackaging fruits and vegetables.

2. Justification:

The production of fruits and vegetables in the country is about 20 million tons of which about 20% valued at about Rs.240/- crores is spoiled during transportation, storage and distribution. It is possible to reduce this loss by at least a quarter of the present level by proper packaging. Prepackaging is one aspect of packaging wherein the fruits and vegetables are prepared for sale and packaged in transparent flexible packages. By this, the shelf-life of the fruits and vegetables can be doubled even at room conditions and also provide protection from physical damage thereby decreasing the loss that occurs mainly during the distribution and storage. Prepackaging also helps in the hygienic distribution and also in marketing the produce. At least 3-4 million tonnes, which may be sold in urban markets, have the potential to be prepackaged. Thus, prepackaging can play a tremendous role in the economic and social development of the country.

As fruits and vegetables respire and transpire there should be sufficient ventilation to the packages. In our earlier prepackaging studies, it was observed that when the ventilation holes are provided on an arbitrary choice as is usually done, it leads some-times to the condensation of moisture inside the packages thereby causing the rot to the produce or over-aeration resulting in excess physiological loss of weight. Due to this problem the full advantages of prepackaging could not be realised. Then methods to optimise the packaging parameters of aeration like the size and number of holes and their location (distribution) are worked out to minimise these losses it will be possible to design better functional packages thereby realising full advantages of prepackaging. Ventilation holes, on the other hand, reduce the strength of the package thereby requiring the compensation of the loss of strength by extra packaging material. But when the

holes are also optimised for minimum loss of strength, this extra packaging material can be saved partly.

3. Objectives:

To optimise ventilation in prepackaging film bags containing fruits and vegetables for minimising: (a) condensation of water inside bag and (b) physiological loss of weight from the produce and also (c) the loss of strength of the bag.

4.1 Nature of Investigation: Applied

4.2 Classification: Methods/Improvement

4.3 Orientation: Conservation

5. Period: April, 1973 to March, 1975

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of Rice Milling Equipment, viz.,
Paddy Cleaner, Paddy Dehusker, Paddy
Separator, low capacity efficient rice
mills for villages

2. Justification:

Rice Milling is the largest single food industry in India which handles about 300 million tonnes of rice annually. Yet, it is very poorly organised and uses to a large extent the outdated technology resulting in poor milling outturns non-utilisation of byproducts. Research work on modernising rice mills and on utilisation of better equipment and machinery has received priority attention of the Government and the Industry. There are about 45,000 Huller Mills which are simple and inefficient and 5,000 large capacity automatic mills in the country. These automatic units are of old design and are obsolete but better than Huller mills although less efficient than modern mills. A few manufacturers who have been licensed with foreign collaboration, manufacture as a whole the modern rice milling equipment. There is a need for other agencies to manufacture the individual units and improved rubber roller sheller.

3. Objectives:

Designing and fabrication of better rice milling equipment. The satisfactory units should be exploited by the industry for mass production. Enough extension work has to be undertaken so that many existing rice mills utilise these units in their mills in place of old and obsolete ones.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Industrial Development

5. Period: April, 1973 to March, 1975

Discipline: Process Development &
Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Suitability of the newly introduced high-yielding varieties of potatoes for different types of processing

2. Justification:

As a sequel to the 'Green Revolution', there has been a tremendous spurt in the production of potatoes in recent years. The annual production of potatoes in India, which was of the order of 2.7 million tonnes in 1959-60 increased to 6.5 million tonnes in 1967-68 and is expected to touch the figure of 13.5 million tonnes at the end of the Fourth Plan.

Since the suitability of potatoes to different types of processing will be determined by varietal characteristics, a systematic study of the suitability of the new high-yielding varieties to various types of processing is highly desirable in the context of the utilisation of the surplus potatoes by the Food Processing Industry.

3. Objectives:

To study the suitability of the newly introduced high yielding varieties for dehydration in piece form (with and without puffing) as well as mashed form and chipping with a view to upgrading the quality of the processed potato products to cater not only to Defence needs but also the civilian market and possibly also the export market. This would help establish the potato processing industry on a sound basis so that the bulk of the surplus production of the suitable varieties can be diverted to processing, thereby ensuring stabilisation of the price during the glut season and an economic return to the cultivator.

4.1 Nature of Investigation: Applied

4.2 Classification: Product and Process Research

4.3 Orientation: Conservation

5. Period: July, 1971 to December, 1973

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process development studies on the methods of drying harvested commodities with special reference to groundnut, cardamom and coffee.

2. Justification:

The discovery of the presence of aflatoxin in groundnut seeds and the resultant oil cake and oil free meal has been attributed to the mould growth on the moist seeds. This has focussed much attention on the need for efficient and quick drying of groundnuts after harvesting. India today produces 4.00 million tonnes of groundnut kernels with aflatoxin content varying from 0.1-1.5 ppm. There is a great danger of losing export market if immediate steps are not taken to bring down toxin level to 30 microorgams per kg. as prescribed by international organisations. There is an urgent need for an economic quick drying of harvested groundnuts to improve the quality of dried kernel.

3. Objectives:

It is proposed to construct a natural draft convection drier with a base area of 64 sq. ft. and a forced draft bin drier to handle 500 kg. of harvested groundnuts and other materials. The drying data obtained on these driers will be useful in sizing field driers for the above commodities and also will indicate the economics of artificial drying methods for harvested commodities.

4.1 Nature of Investigation: Applied

4.2 Classification: Process research,
design & fabrication

4.3 Orientation: Conservation, efficient utilisation of
raw material

5. Period: January, 1973 to Dec., 1974

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Developmental studies for production of compressed Bakers' Yeast from Molasses.

2. Justification:

It is estimated that 40 tonnes of compressed yeast are required per annum for each of our Modern Bakeries and 12 units are spread over the country. The requirements of smaller bakeries and biscuit manufacturers are also of a very high order.

Dry Bakers' yeast was produced by M/s. Indian Yeast Company and compressed yeast was made by M/s. Mohan Meakin Breweries Ltd., Ghaziabad, and the Indian Yeast Company.

The know-how for the manufacture of Bakers' Yeast has been released to M/s. Mohan Meakins for setting up a yeast plant at Mohan Nagar in 1968. Based on the experience gained during the operation, several modifications of the process are envisaged in the production of yeast. Enquiries have been received from many entrepreneurs for setting up the yeast plant. It is therefore proposed to set up a model yeast plant, study the process units and modifications envisaged and collect scale up data. The data will be necessary in the design of yeast plant. The equipment will be used for studies on continuous yeast product.

3. Objectives:

Setting up an unit for molasses fermentation; collection of process data for scaling up.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Industrial Development

5.0 Period: From February 1972 to July 1972.

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of a 'Destoner' for dry granular commodities.

2. Justification:

Commodities like oilseeds (sesame and mustard), spices, cereals and pulses invariably contain stones, fine sands and other foreign matter. While processing it is necessary to remove all the impurities to produce quality products.

The production of spices alone is of the order of 8,86,160 tonnes/year and is fetching about 390 million rupees in foreign exchange. Most of the factories do not have any pre-cleaning equipment which are imported.

A cleaned product commands a better price both internally and abroad. It is proposed to develop a destoner for small scale industry handling the above mentioned commodities.

3. Objectives:

It is used in the pre-cleaning stage and is expected to find immediate exploitation. The know-how to be handed over to the small scale sector for indigenous manufacture.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and Fabrication

4.3 Orientation: Import substitution -
Export promotion

5.0 Period: January 1972 to
December 1972.

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of a screw pump(S.S)

2. Justification:

We have been getting enquiries for forced circulation evaporators from small scale industries for concentrating viscous liquids. These units require large capacity and low pressure circulating pumps. At present, high speed centrifugal pumps are being used. These are unsuitable for products like Tomato, tamarind, etc., where there is loss of efficiency and non-uniform pumping at higher concentration due to the high viscosity.

We have supplied designs for tamarind and tomato concentrator to give small scale industries using centrifugal pumps. These require to be changed to screw pumps.

3. Objectives:

Screw pumps being a part of plant is required to replace the centrifugal pumps now being used for pumping sensitive and delicate materials cold or hot. The know-how can be made available to the small scale sector for indigenous manufacture.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Import substitution

5.0 Period: June 1973 to June 1974.

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of extrusion cooking techniques for certain cereal based products and Design and fabrication of a prototype extrusion cooker.

2. Justification:

Extrusion cooking technique for preparing textured protein products, macaroni and other products is a cheaper method than the conventional processing which is capital intensive and also has high conversion cost. The food habits in India are changing and there is bound to be a demand for extrusion cooked products and cookers. Imported cookers of capacity 100-150 lbs/hr cost as high as \$ 30,000. Hence, there is a necessity for developing our own know-how and indigenous designs for efficient extrusion cookers.

3. Objectives:

To acquire extensive knowledge of extrusion cooking technique; Design and fabricate prototype cookers and standardise designs for various capacities and products. Further to develop and introduce new extrusion cooked products from Indian raw materials.

4.1 Nature of Investigation: Applied

4.2 Classification: Process research, design and fabrication.

4.3 Orientation: Import substitution, improvement in food habits.

5.0 Period: From January 1974 to June 1976.

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the moisture sorption characteristics of some important dried Indian foods and development of unit packages for these food-stuffs for grocery shops and super markets.

2. Justification:

A good shelf life of the dried product is greatly influenced by its sorption characteristics, which is generally expressed by the relationship between the relative humidities and equilibrium moisture content of the product. A study of the moisture sorption properties of typical foods in relation to its approximate composition will help in directly predicating the sorption behaviour of other foods. Further, this helps in suggesting a suitable package without much experimentation and hence saves a lot of time.

Rapid industrialisation and consequent urbanisation is leading to the need of opening supermarkets where almost all the necessities of the consumers are met with. Generally consumers do not prefer bulk purchase of consumables like cereals, pulses, spices etc. Further, weighing out from bulk containers will lead to lot of wastage and often affect the organoleptic qualities. Also, there is likelihood of the food material getting infested during storage if not protected from insects, moulds, etc. It is in the wake of these problems, packaging of dried foods in commercial unit packs will be most useful.

3. Objectives:

- i) To categorise the dried foodstuffs according to their moisture sorption characteristics;
- ii) To develop cheap and functional unit package for common foodstuffs like pulses, spices, sugar and ground coffee from available packaging materials so as to withstand the handling hazards in the normal grocery shops or super-markets and to give adequate shelf-life.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Welfare

5.0 Period: January 1970 to
Jan. 1973

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Survey of indigenous packaging materials for their suitability for packaging food stuffs.

2. Justification:

Many varieties of packaging materials are used in contact with food stuffs. That cover Al. foil, plastic films (such as polyethylene, PVC, polypropylene) Cellophane, paper, laminates and coated combinations of the above materials. Paper boards and solid fibre-boards coated or treated are likely to be used on a large scale as containers for various food stuffs.

The various food stuffs comprise alcoholic beverages, bread, confectionery, cashew, cocoa products, coffee, fish products, milk products, oil seeds and oil products, tea, yeast, etc. Demand estimates for various packaging materials for packaging different food stuffs are very large. Ref: Development programme for the packaging industry in the Fourth Plan- Report of the Committee appointed by the Planning Commission - 1969.

The investigation will lead to (a) proper use of the packaging materials produced in India and reduces waste due to improper use and (b) helps in pointing out the deficiencies of the existing packaging materials for packaging of particular food stuffs.

3. Objectives:

To screen indigenous flexible packaging materials for their efficiency and suitability for packaging food stuffs.

4.1 Nature of Investigation: Applied

4.2 Classification: Survey and materials research

4.3 Orientation: Substitution, welfare, food and agricultural development.

5.0 Period: Jan. 1970 to Jan. 1973

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of pouch forming, filling and sealing machine for free flowing granular food materials.

2. Justification:

The non-development of indigenous packaging machinery to-day is a retarding factor in the country's progress. In order to meet the increased demand of the packages, the manufacture of packaging machinery indigenously is essential. The present machinery manufacturers do not have sufficient know-how to take up the indigenous production of packaging machinery of their own. Most of the food packaging machinery available in the country are imported. The development of high-speed food packaging machinery in our country will vastly improve the packaging efficiency.

3. Objectives:

To design and to fabricate one pouch forming, filling and sealing machine (pneumatically operated) capable of producing about 1800 bags per hour.

4.1 Nature of investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Import substitution

5.0 Period: April 1972 to March 1975

Discipline: Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

To design suitable flexible consumer packages for ready-to-serve common food items.

2. Justification:

Many food items like cooked cereal preparations (curd bath, vanghi bath), fried pulses preparations (vada, bonda) and milk products are distributed in large quantities in Railway platforms, fetes and festivals generally in unpackaged condition. Sometimes, traditional packaging materials like banana leaves, Butea frondosa leaves and Bauhinis leaves are used for packing these products. Under these conditions, the food materials will have very short shelf-lives. Milk products like unpasteurised butter and khova preparations are also offered either in unpackaged condition or packed in improper materials. Under these circumstances, the products will have very short shelf-lives. By packing them in suitable packaging media, not only the shelf-life of the produce could be increased considerably, but also it can help in hygienic distribution. Thus, large quantities of ready to serve foods and milk products could be saved from wastage.

3. Objectives:

To design cheap and adequate flexible consumer packages for ready-to-serve common food items for quick and hygienic distribution.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Welfare and improvement

5.0 Period: April 1973 to March 1975

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development & design of functional and protective consumer packaging for predominantly oxygen sensitive food stuffs.

2. Justification:

In recent years, much emphasis is laid on production of dehydrated foods. Of these, milk based baby foods, weaning foods and malted foods are important to solve protein malnutrition in the country and their production is expected to rise to about 45,000 tonnes by the end of IVth Plan (Development Programme for Packaging Industry during IVth Plan). Egg powder, freeze dried shrimp and minced dehydrated meat are of defence importance and are planned to be produced on commercial scale during IVth Plan. Cashew nuts are of great export importance and a production target of 100,000 tonnes has been fixed by 1973/74. All these products contain oxidisable fats and sensitive to oxygen specially at the low moisture levels, and hence are packaged under nitrogen in tin cans or glass bottles (jars).

Maximum permissible residual oxygen levels in the container are not established and optimum and economic gas packaging schedules to achieve the desired oxygen levels are not available for these products. The establishment of these levels and schedules will help increase their shelf-life and also reduce the cost of gas packaging.

Number of flexible packaging materials such as polyethylene, cellulose film and its laminates, PVC films (food grade) and Al. foil laminates possessing varied functional properties are now available in the market. These materials afford the possibility of usage as functional and protective packaging materials for the oxygen sensitive food stuffs. Development and design of consumer packaging using these new laminates is helpful in relieving pressure on the conventional glass and tin containers and also is helpful in institutional feeding programmes.

3. Objectives:

To work out optimum gas packaging schedules for different dehydrated foods, to develop cheap and functional unit packages for the dehydrated foods from indigenously available flexible packaging materials and to improve their shelf life.

- 4.1 Nature of investigation: Applied
- 4.2 Classification: Product Research and
Process Research
- 4.3 Orientation: Defence/Substitution
of tin & economic
utilisation.
- 5.0 Period: April 1973 to
March 1978

Discipline: Discipline of Process Development & Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Osmosis Dehydration of Fruits.

2. Justification:

Of late, there has been a spurt in the production of fruits in the country and this is a continuing trend. Apart from cold storage which can help preserve fruits for only limited periods, dehydration is the most feasible method of preservation to take care of the seasonal gluts and regional surpluses.

Upgrading the quality of dehydrated fruits would involve dehydration at a low temperature which means freeze-drying which is far too costly. An alternative approach would be to cut down the period of exposure to the hot air by removing an appreciable proportion of the moisture in the fruit by some means at a sufficiently low temperature. A facile method of achieving this would be by osmosis of cut pieces of fruits against concentrated sugar syrup since fruit cells contain dilute solutions of sugars and other solutions and the cell walls can act as a semi-permeable membrane. Hence, the value of osmosis dehydration as a technique of preparing dehydrated fruits of superior quality.

3. Objectives:

To fix optimal conditions for osmotic dehydration of different fruits with special reference to tropical fruits and carry out studies with a view to collect data for scaling up. This would help establish the fruit dehydration industry on a sound basis so that the bulk of the surplus production can be diverted to processing, thereby ensuring stabilisation of the price during the glut season and an economic return to the cultivator.

4.1 Nature of Investigation: Applied

4.2 Classification: Process & Product Research

4.3 Orientation: Conservation

5.0 Period: From Jan. 1974 to Dec. 1976.

Discipline: Experiment
Station
Head-quarters

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of Sardine Oil for use in food industries.

2. Justification:

At present sardine-oil (with a production figure of 4,000 tonnes) due to its poor quality, has only a very limited use as a preservative for boats against weathering and shipworm attacks. But the properly extracted sardine-oil has many industrial uses. Processed sardine oil can be used in canning of fish, processed oil with high iodine value may have pharmaceutical use to lower blood cholesterol level and deodourised sardine oil can be put to various uses.

3. Objectives:

The objective of the project is better utilisation of sardine oil through proper processing industry, and as a pharmaceutical product. At present groundnut oil or cottonseed oil is used in India for canning of fish in oil. These oils can be substituted by properly extracted marine oil which is much cheaper. Fraction of sardine oil with high iodine value has the possibility of being used to lower down blood cholesterol level. Deodourised sardine oil can be utilised in soap industry, as margarine and in canning (fish) industry.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Raw material utilisation.

5.0 Period: April 1970 to
December 1974.

Discipline: Experiment Station,
Headquarters,
Ludhiana

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Prevention of deteriorative changes in
Walnuts during processing and storage.

2. Justification:

The annual walnut crop in India is about 14,000 tonnes. On an average 5000 tonnes of walnuts are exported from the country. In 1968-69 the export was 5306 tonnes valued at Rs.2.84 crores. According to a market survey, by exporting the same quantity India could earn atleast another 0.5 crore rupees.

The present project aims to overcome the defects (which pertain mostly to processing and storage) and reduce the present economic losses.

3. Objectives:

1. Prevention of discolouration in kernels during storage.
2. Reducing breakage of kernels during shelling and transportation.
3. Retarding onset of rancidity in kernels.
4. Designing equipment for application of anti-oxidants, shelling and drying.

4.1 Nature of Investigation: Applied Research

4.2 Classification: Process Research

4.3 Orientation: Export Promotion

5.0 Period: January, 1972 to
December, 1974.

Discipline: Experiment Station
Headquarters,
Bombay, Nagpur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Investigations on Indian Sweets - their preparation, quality control and storage

2. Justification:

There are about 700 sweet meat dealers in Bombay alone whose turnover is about Rs.10 crores annually. No such figure is available for the country, which may well run into a multi-million affair.

Because of some handicaps the manufacturers are facing with respect to standardising methods of preparation, storage, etc., this industry has not attained a sound footing as compared to Western confections. In view of this, a detailed scientific and technological understanding of the industry is called for.

3. Objectives:

To help the Indian Sweet Meat Manufacturers in increasing the production by standardising methods of preparation and the storage life so that the marketing potentiality is increased.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Product improvement

5.0 Period: April 1973 to
March 1977

Discipline: Experiment Station,
Lucknow

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on sweets based partially or wholly on fruits and vegetables.

2. Justification:

In U.P. an estimated quantity of 450 tonnes of carrot halwa worth Rs.20 lakhs are manufactured. The figures for ash gourd burfi are still higher being 30,000 tonnes worth Rupees One Crore. The industry is still operated on cottage scale and there is need to go into the various problems faced by the industry in preparation, processing and storage. The main problem in the manufacture of carrot halwa is the variation in the quality of the product from lot to lot due to non-standardisation of recipes and processes. The very short shelf life of this product (2 days) is another problem the manufacturers face. In burfi manufacture the main problem the manufacturers face apart from non-standard recipes and processes, is drying of the product after manufacture.

3. Objectives:

1. Survey of fruit and vegetables based sweet manufacturing industry.
2. Proper utilisation of fruits and vegetables in preparation of sweets in glut season.
3. Helping existing small scale manufacturers of these products in increasing, standardising and improving their manufacturing process.

4.1 Nature of Investigation: Applied

4.2 Classification: Process/product research/extension

4.3 Orientation: Product improvement

5.0 Period: January 1970 to
January 1974.

Discipline: Experiment Station,
Bombay & Nagpur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Investigations on traditional salted snacks

2. Justification:

There are many traditional snack items made from cereals, pulses, oilseeds, farinaceous materials or combination of them. Of late, these items are getting popular in retail stores in convenient unit packs. To obviate the present storage problems like rancidity, investigations on various aspects of manufacture, packaging, storage is necessary.

3. Objectives:

1. Survey of the industry to identify problems.
2. Screening of frying fats to obtain maximum storage life.
3. Selection of suitable packaging.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Product improvement

5.0 Period: April 1973 to March, 1977.

Discipline: Experiment Station,
Trichur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilisation of Nendran Variety of Bananas

2. Justification:

Nendran variety of bananas is largely grown in Kerala State (approximately 9204 hectares, annual approximate production being 67,060 tonnes). This fruit is mostly utilised locally for culinary purposes as raw fruit and as steamed fruit in the ripe stage. A quantity is used for preparing chips in cottage scale. If the Nendran variety of banana in Kerala with an annual tonnage of 67,060 is utilised by the industry in processed forms on a commercial scale, it will have a good impact on the economy of the State.

3. Objectives:

Standardisation of the method of preparation and storage of banana chips and conventional Kerala dishes from banana like "Sarkara upperi" (sweetened chips), "Halwa" Jam and Payasam.

4.1 Nature of Investigation: Applied

4.2 Classification: Process and Product Research

4.3 Orientation: Raw material utilisation

5.0 Period: January, 1970 to December, 1972.

Discipline: Experiment Station
Hyderabad

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Investigation on pre-treatment and packaging of Anab-e-shahi grapes for economic marketability studies.

2. Justification:

Grape cultivation has expanded to a great extent in Andhra Pradesh in the recent years. The total area is estimated around 2,000 hectares. Out of this nearly 1,000 hectares are concentrated around Hyderabad City. Anab-e-Shahi is the principal variety grown. The total production of grapes in Hyderabad District is expected to be about 30,000 tonnes.

Due to perishable nature of the fruit and also due to defective handling and storage practices, generally heavy losses take place during handling and transportation. Berry drop at different stages of handling and transportation which comes to 15-20% of the grapes handled is a serious problem. 25-30% of spoilage was noticed by us during the cold storage of grapes over a period of 4 weeks in the local cold storages.

3. Objectives:

1. Commercial application of existing information.
2. To carry out further investigation on step end rot, berry drop and spoilage in transit and cold storage.
3. To improve shelf-life of fresh grapes.

4.1 Nature of Investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Conservation

5.0 Period: December 1972 to June 1973.

Discipline: Experiment Station
Hyderabad

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the post-harvest ripening and storage behaviour of Banganapalle (Baneshan) and Neelum varieties of mangoes at different storage temperatures

2. Justification:

Mango is an important commercial crop of India, constituting about 35% of the total production of fruits and vegetables. Andhra Pradesh has a large area, spread over 1,27,136 hectares under mango cultivation. The annual production is estimated to be 12,08,250 tonnes. Baneshan and Neelum are the most important commercial varieties, which are marketed practically throughout the country. The total production of fruits of Baneshan variety in Andhra Pradesh is estimated to be 74,250 tonnes annually.

Properly and uniformly ripened fruits of these varieties have desirable soft texture and pleasing colour and aroma, characteristic of the variety and have a good consumer acceptance. But unevenly ripened fruits are poor in colour, texture, taste and flavour. According to the existing trade practices all the fruits on a tree are harvested at a time looking at the maturity of the majority of fruits and also depending on the fluctuations in the market prices. The entire bulk of the harvest, therefore, has fruits of all maturities. The mature fruits ripen fast and generally marketed in the local and nearby places because of the heavy incidence of spoilage during long transit. For distant places mostly under-mature fruits are sent. Often these under-mature fruits fail to ripen satisfactorily at the place of destination and hence present a very poor picture of these varieties which are second to Dusheri and Alphonso only in commercial fruit trade. It is, therefore, necessary to study the post-harvest ripening behaviour and storage life of these varieties under different storage conditions for (i) enhancing the storage life of fully mature fruits and (ii) induce uniform ripening of the under-mature fruits. Baneshan variety has a great export potential. These studies will greatly enlarge the scope and possibilities of developing a good sustained export and internal market for these varieties.

3. Objectives:

1. To study the post-harvest physiological changes in Baneshan and Neelum varieties of mangoes of Andhra Pradesh with a view to extend their storage life and induce uniform ripening.
2. To reduce spoilage during storage and transit and improve marketability of these promising varieties of mango over long distances and thereby increase their export potentials.

- 4.1 Nature of Investigation: Applied
- 4.2 Classification: Material Research
- 4.3 Orientation: Conservation
- 5.0 Period: April, 1972 to
March, 1976.

Discipline: Experiment Station,
Ludhiana

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation and development of commonly used pickles in the region.

2. Justification:

Of the one hundred and odd licenced food processing units in the region, almost eighty per cent manufacture only traditional items like pickles and chutneys. The industry employs traditional methods using manual labour for the preparation of these products. Incidence of yeast spoilage, softening of slices (especially mango), corrosion of cannisters (packed in bulk) and the presence of high content of tin and lead in sweet turnip and cauliflower pickles, poor keeping quality are a few problems facing the industry. Considering the enormous potential demand which lies ahead for this product, it is necessary that this industry should be put on scientific lines.

3. Objectives:

- i) Survey of pickle industry of the region.
- ii) To standardise common recipes of pickles of the region and work out processing schedules to manufacture pickles on scientific lines.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Conservation

5. Period: April 1972 to March 1976.

Discipline: Experiment Station,
Ludhiana

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Post-harvest handling, storage and packing conditions for various varieties of apples, apricots, pears and peaches.

2. Justification:

There are about 40,000 acres under temperate fruits in India, the major part is under apple. No reliable data are available regarding the acreage and production of apples in different States. Area under different temperate fruits in the Himachal Pradesh is reported to be apples : 5984 acres, peaches: 297 acres, apricots: 400 acres, pears: 248 acres. Other important zones of cultivation are Kashmir, Kulu and Kumaon. These fruits play a very important part in the internal trade especially now since more and more area is being planted under these crops with the help of State Departments and other International Agencies like World Bank, etc.

In the absence of proper procedures for handling, storage and packing of the above fruits, losses of the produce to the extent of 20-30% take place.

3. Objectives:

- i) To work out standards and schedules for time and stage of harvesting, handling of fruit, grading of fruit, packing, transport, storage and marketing of apples, pears, apricots and peaches.
- ii) To cut down the losses due to faulty handling and storage and
- iii) To expand the market of fresh fruits.

4.1 Nature of investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Conservation

5. Period: April 1972 to
March 1976.

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation of recipes for products developed from fish/fish meal/press cake of oil-sardine and trash fish of limited commercial importance.

2. Justification:

Quite a substantial portion (about 20,000 tons in Mysore State) of oil-sardine catch during season is converted into guano and fish manure. Fish thus utilised may be considered as a wastage. Also miscellaneous varieties of fish, caught by mechanised boats (20% of total marine landing, about 240,000 tonnes) is not properly utilised. The project aims at the development of products involving such fish or fish meal or presscake therefrom so that fish protein of good quality can reach public in a nutritious, delicious and processed or semi-processed form.

3. Objectives:

- i) Project aims at the development of nutritious and delicious products (in partially processed or ready-to-serve forms) involving fish/fishmeal/press-cake. A few such products are
(a) ready-mix for fish cutlets, (b) fish fingers, (c) fish steak, (d) fish balls, (e) smoked fish, etc.
- ii) Prevention of wastage of certain varieties such as oil-sardine, and better utilisation of certain other varieties of fish captured by mechanised boats, are the long range objectives.

- | | |
|-------------------------------------|--------------------------------|
| 4.1 <u>Nature of investigation:</u> | Applied |
| 4.2 <u>Classification:</u> | Product Research |
| 4.3 <u>Orientation:</u> | Raw material research |
| 5. <u>Period:</u> | April 1970 to
October 1972. |

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of precooked, ready to use dehydrated fish products.

2. Justification

Canning and freezing have remained to be the more successful ways of industrial utilisation and preservation of surplus catches of fish. They cater to certain sophisticated sections of the market and we are selective in terms of raw material. They tend to be costly in the Indian context in terms of capital investment, processing and marketing costs and eventually in terms of their cost to the consumer. Conventional drying in the sun with or without salting represents a far wider attempt at conservation of available raw material resources handling upto 20% of marine fish catch in India. But the product is beset with serious deficiencies in physical, chemical and microbiological quality, although catering to wider sections of the population. Dehydrated, pre-cooked fish products would therefore serve as a via media between the disadvantages of conventional and modern methods of preservation currently in use in India. Attempts in this direction could help in the growth of a new industry.

3. Objectives:

i) Development of pre-cooked, dehydrated products based on marine fish. Desirable attribute of such products would be ready reconstitution with higher water imbibing capacity, desirable texture, retention of desirable fish odours and non-development of rancid or other off odours.

ii) Product design for development of new industrial means of utilisation and preservation of marine fish for diversifying marketable processed fish product.

4.1 Nature of investigation: Applied Research

4.2 Classification: Product Research

4.3 Orientation: Raw material Utilisation

5. Period: April 1972 to March 1978.

Discipline: Experiment Stations,
Headquarters

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on dough rheology, preservation and mechanisation in papad manufacture.

2. Justification:

Enquiries received from papad manufacturers and the analytical survey of over 30 commercial samples by this Institute revealed the frequency of spoilage in papads due to faulty processing as well as wide variation in physico-chemical and organoleptic quality parameters. The increasing export potential (exports for 1969-70: 633 tons valued at 2.24 million rupees) brings out the need for quality control, adequate shelf life and protective packaging and calls for mechanisation of laborious and time consuming processing operations.

3. Objectives:

- (i) To introduce quality parameters in the papad industry, so far following the traditional methods of preparation and packaging.
- (ii) To design and fabricate a prototype assembly for kneading, sheeting, cutting, drying and packaging operations in papad manufacture.

4.1 Nature of investigation: Applied

4.2 Classification: Process and product research, design and fabrication.

4.3 Orientation: Export Promotion

5. Period: May 1971 to December, 1974.

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Discipline: Experiment
Station,
Nagpur

✓ SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of drier for dehydration of chillies.

2. Justification:

With the development of hybrid varieties of chillies the yield per acre has increased from 3 to 4 Qt. to about 40 Qt. Progressive growers are therefore taking up cultivation of hybrid variety and in time to come the quantum of production will increase. Green chillies are at present sold fresh in the market, while the red chillies are dried before marketing. The area under chilli cultivation in Umrer, Bhiwapur and their surroundings is estimated to be over 40,000 acres yielding about 1,600 tonnes of red chillies. This is expected to increase further in the near future due to the programme of introducing the hybrid variety. The red dried chillies are being exported at present (mostly to Ceylon) valued at Rs. 2 crores. With increase in production the export of this commodity is also likely to increase. In order to cope up with the bulk of production which can now be throughout the year in irrigated areas, an urgent need is being felt to establish a dehydration plant in the region.

3. Objectives:

- i) To design and fabricate a pilot dehydration plant (Through Flow Drying) for drying green/red chillies and other foods. This will establish dehydration condition based on quality parameter and provide data for fabrication of a commercial plant.
- ii) To establish commercial dehydration plant in the chilli growing areas in the country to cater to the internal as well as external market demands.

4.1 Nature of investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Wastage utilisation

5. Period: April 1972 to March 1974.

Discipline: Experiment Station,
Nagpur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Nagpur 'Santra' : Utilisation of orchard
fruit drops and culls

2. Justification:

In Vidarbha region of Maharashtra, culls
account for a minimum of 6000 tons of
oranges, valued at about 3 million rupees.
The orchard fruit drop at various stages
of development of the fruits is estimated
to be 25-30% of total number of fruits
on the tree.

3. Objectives:

- (i) To explore the possibilities of
utilisation of culls and fruits drops
for the manufacture of products such
as orange oil, orange juice free
from bitterness, etc., along with
commercial products.
- (ii) To evolve a model unit for
adoption by the growers.

4.1 Nature of investigation: Applied

4.2 Classification: Material &
Product Research

4.3 Orientation: Wastage utilisation

5. Period: April 1972 to March 1975.

Discipline: Experiment
Station,
Trichur

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on cashew kernels - To formulate optimum quality standards.

2. Justification:

The cashew processing industry is an important export oriented industry exporting nearly 65,000 tonnes of kernels valued at about Rs. 61 crores.

3. Objectives:

- i) To study the factors basic to quality of cashew kernels and fried-salted or non-salted cashew kernels.
- ii) To formulate standards for optimum quality products.
- iii) The trade operation at present on the basis of agreement between buyer and seller regarding the quality of the product. It is desirable to systematically and formulate standards on a wider basis.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Export Promotion

5. Period: April 1972 to
March 1975

Discipline: Experiment Station,
Bombay

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilisation of Custard Apple

2. Justification:

Annual production of custard apple fruits in Andhra Pradesh is estimated to be 75,000 tons. No fruit product is manufactured from this fruit. The problems connected with the processing of custard apple are:

- (i) presence of undesirable gritty matter in the pulp;
- (ii) development of bitterness on heating the pulp;
- (iii) pink/brown discolouration on storage.

The project aims to a better utilisation of the fruit through the solution of the above problems.

3. Objectives

- (i) To assess the possibilities of making different fruit products and their preservation from the pulp of the custard apple.
- (ii) To explore the use of custard apple rind and seeds for the preparation of cattle and recovery of oil and similar other uses.
- (iii) These studies will contribute to the development of fruit preservation industry by way of providing them with an additional raw material and thus help the industry in reducing their off-season and increasing productivity which will result in reducing the over-heads.

4.1 Nature of investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Raw Material
Utilisation

5. Period: September 1969 to
December 1972.

Discipline: Sensory
Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Protein Chewy Candies - Experimental
Production Studies.

2. Justification:

Protein malnutrition is widely prevalent in India. Pregnant and lactating mothers and children under 6 - the most vulnerable groups form about 50% of the population. Sweets, a prestige food is likely to be readily acceptable and a good vehicle to combat protein malnutrition. The total confectionery production in India in 1970 was 14,680 tonnes. In 1969-70 India exported 342,719 kg. of confectionery valued at Rs. 7,70,732. The import of other confectionery during the same period was 49,593 kg. valued at Rs. 1,55,988. Earlier work in Project 236 has shown the feasibility of producing Chewy Candy confections with 20% protein using groundnut protein concentrate and isolate. Sensory evaluation of the protein chewy candies by children and adult panels have proved their acceptability.

3. Objectives:

- i) To study problems of large/^{scale} manufacture and selection of suitable equipment for protein Chewy Candy.
- ii) Consumer acceptance studies and trials
- iii) Promotion of the nutrition of the people
- iv) Development of methodology for sensory evaluation.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Social Welfare (Nutritional supplement);
Industrial and economic development

5. Period: January 1972 to
March 1973.

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Ready to use flavour blends for
Indian Cuisine

2. Justification:

During 1970-71 India exported 44,661 tonnes of spices valued at Rs. 370 million and 1712 tonnes of curry powder valued at Rs. 7.5 million. During 1968-69 2,04,558 kg. of spice essential oils valued at Rs. 8.3 million were imported whereas only 388 kg. valued at Rs. 23,976 were exported against the annual production of 8,180 kg.

Indian cuisine is rich and varied. Like curry powder, standard quality spice blends with all India acceptability will find a wide internal and external market.

The industry needs to be put on a better foundation by not supplying raw materials but more of finished products.

3. Objectives:

Development of ready to use spice blends for some popular Indian dishes. Development of suitable standard quality flavour blends for Internal and external market.

Survey of the existing industry, their mechanisation and packaging.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Raw material utilisation

5. Period: January 1972 to March 1979.

TITLES OF R&D PROJECTS FOR IV FIVE YEAR PLAN

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Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Control of Microflora and related production of mycotoxins in sorghum, rice and groundnut.

2. Justification:

Seventy per cent of the total production of foodgrains (70-75 million tonnes) are stored in the rural areas in above ground structures or underground structures. Under these conditions of storage, although insect infestation is limited, the growth of microflora due to moisture migration and seepage result in loss in the stored grains. The quality is also substantially affected and evidence of the elaboration of toxins have also been obtained. Work on the screening of sporicidal fumigants and the principle of aseptic hermetic storage have been carried out at this Institute.

The export earnings on groundnut and other oil-seed cakes are in the range of Rs. 50 crores and above. The fungal and insect contamination in these products are controlled by the regulations of the importing countries. From the country's economic point of view, the control of insects and microflora prior to export to other countries is extremely important for foreign exchange earnings.

3. Objectives:

- a) To study the microbiological aspects of the development and control of microflora and related production of mycotoxins in stored sorghum, rice and groundnut.
- b) To develop methods for controlling fungal spoilage in underground pits and storage bins in rural areas.

4.1. Nature of investigation: Application Oriented
Basic

4.2. Classification: Materials Research

4.3. Orientation: Conservation and Welfare

5. Period: Continuation of PL-480 Project
IC 14/225 to August 1972.

Discipline: Infestation
Control &
Pesticides.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Nature and significance of residues of phosphine and methyl iodide used as fumigants on stored foodgrain and grain products, nuts, nut-meats, spices, dry fruits, processed foods including protein-rich and fortified foods.

2. Justification:

Elimination of toxic hazards when methyl iodide and phosphine are used to control pests in stored food products.

3. Objectives:

Development of safe fumigants for disinfection of stored food products:
Trials on methyl iodide and phosphine.

4.1 Nature of investigation: Application
oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Food sanitation,
and health.

5. Period: July 1971 to July 1974.

Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Assay of pesticides and other contaminants
of grains with microorganisms

2. Justification:

Foodgrains contain the residues of pesticides, insect contaminants and other fungal metabolites. Although chemical methods of analysis are available, the bioassay using microorganisms would be economical for routine analysis where certification for quality of foodgrains are involved. If standardised, this method could cover the analysis of residues of common insecticides and fungicides as well as fungal metabolites, including mycotoxins.

3. Objectives:

To develop techniques using microorganisms for the detection of pesticidal residue and mycotoxins present in foodgrains.

4.1 Nature of investigation: Application Oriented
Basic

4.2 Classification: Materials Research

4.3 Orientation: Food and Agriculture/
Welfare

5. Period: April 1973 to
March 1979.

Discipline: Infestation Control &
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of insect infestation on the nutritive value
of common cereals and pulses

2. Justification:

It is generally recognised that large quantities of
stored food grains are infested by insects and 20 to
30% of the kernels may be eaten away by insects. Very
little information is available on the overall nutritive
value of the food and nutritive value of the proteins
of the food subjected to insect infestation.

3. Objectives:

The objectives of the project is to assess the extent
of deterioration in the nutritive value as a result of
insect infestation. The Degree of spoilage of the
grains will be assessed by the following criteria:
kernel damage, bulk density, frass, insect population,
free fatty acids, uric acid (insect excreta) and insect
fragment count. Rat growth studies will be carried out
to assess the effect of insect infestation on the over-
all nutritive value of food grains and also on the
nutritive value of the proteins.

If we can also assess the extent of damage to the
nutritional quality, it will enable us to take effective
measures to control infestation in foodgrains and also
lay down quality standards for foodgrains and legumes
for the commodities meant for sale.

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Welfare and Nutrition

5. Period: March 1972 to March 1974

Discipline: Infestation Control
& Pesticides.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation and development of simple methods for assaying pesticide residues in food materials.

2. Justification:

The possible hazards from indiscriminate use of pesticides have received increased attention. Date and coworkers (1963) have shown that the concentration of chlorinated hydrocarbons in the body fat of Indian population was 2-3 times higher than that of most other people. Thacker's Committee report suggests that CFTRI should be the main centre to work out analytical methods for pesticide residue in foods. The analysis of certain categories of foods and cattle feeds have shown alarming quantities of insecticide residues. These reports are focussing increased attention on the pesticide residue content of Indian foods. Almost no pesticide residue data is available in India, although such data is essential for the formulations of safe and efficient control practices. Therefore, check-up procedures detection and estimation of certain insecticide residue on certain common foods will be worked out.

3. Objectives:

Certain simple methods standardised under Project No. 228 will be applied to detect and estimate the insecticides in butter, milk and milk products. An All India Survey for insecticide residue in butter will be carried out and the observations will be communicated to Central Committee on Food Standards, Ministry of Food and Agriculture and Municipalities.

4. Nature of investigation: Application Oriented
Basic

4.2 Classification: Process Research

4.3 Orientation: Welfare

5. Period: January 1972 to
December 1974.

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on soft centre in Alphonso
Mangoes.

2. Justification:

Alphonso mango fruit develops a physiological ripening disorder after harvest termed as 'Soft Centre', 'Spongy tissue' or 'Internal breakdown'. Losses due to this ripening disorder are estimated at Rs. 1 million annually in the processing factory alone, since 30% of the 5,000 tonnes of fruits used in the industry develop soft centre and are not fit for slice packing but are used as fruit pulp and nectar of inferior quality. Losses due to this disorder in the fresh fruit market is very high since bulk of the produce (2,95,000 tonnes worth Rs. 295 million) is consumed in the country and about 500 tonnes are exported. Consumer preference for this cultivar will be reduced and export potential will be hampered if this disease is not controlled quickly and effectively.

3. Objectives:

In order to assist the fruit industry with regard to internal trade as well as export, more experimental evidence needs to be collected on causative factors so that a working hypothesis could be proposed for intensive studies. It is also proposed to collect economic data for justification of the long-range project during the V Plan.

4.1 Nature of investigation: Application oriented

4.2 Classification: basic
Material Research

4.3 Orientation: Export Promotion
and conservation.

5. Period: April 1972 to
March 1974.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality Aspects of Coffee.

2. Justification:

With the increased production in the country and to sustain competitive nature of export trade, it is essential to improve the quality of coffee and the products made there from. Nearly 36-35,000 tonnes of coffee are being exported now.

3. Objectives:

The main objective is to study the precursors of aroma forming constituents during roasting of coffee to characterise the various quality factors and evolve a system of quality grading.

4.1 Nature of investigation: Application
Oriented Basic

4.2 Classification: Materials Research

4.3 Orientation: Export Promotion/
Raw material utilisation

5. Period: April 1973 to
March 1976.

Discipline: Plantation Product
& Flavour Tech.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on asafoetida with reference to

(a) Identification of the components responsible for the asafoetida flavour, and

(b) Purity, standardisation and quality control.

2. Justification:

About 5 lakhs kgs. of asafoetida valued at Rs 50 lakhs are being imported and they are used as such or in a compounded form with other additives. No definite standard is available for quality control and it is essential to collect basic data to upgrade this industry.

3. Objectives:

Studies on extraction and identification of flavouring principles and standardise quality control methods.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials research

4.3 Orientation: Import substitution

5. Period: Jan.72 - March 73.

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Evaluation of processed protein foods
and infant foods in infants and
malnourished children.

2. Justification:

There is widespread occurrence of malnutrition among weaned infants, pre-school and school children. Hence special attention has to be paid to the development of supplementary foods for the above category of the population using vegetable protein-rich foods, since there is an acute shortage of milk in the country. Hence the evaluation of processed infant foods based on oilseeds and nuts using infants and children is envisaged.

3. Objectives:

To evaluate processed infants and protein foods by growth and metabolic experiments with infants and children. The results obtained will provide data for proper planning and feeding of infants and children suffering from protein malnutrition.

Effective means of overcoming malnutrition which is widely prevalent among infants and children belonging to the low income groups of the population in the country.

4.1 Nature of Investigation: Application Oriented
Basic

4.2 Classification: Materials Research

4.3 Orientation: Welfare

5. Period: Jan. 72 - March 74

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Mutual and amino acid supplementation of proteins - (i) The availability of lysine and threonine added to cereals and poor cereal diets; (ii) Supplementary value of the proteins of certain oilseed meals and legumes to cereal and millet proteins.

2. Justification:

The results obtained in the present project will help to plan low cost diets which provide adequate amounts of proteins to low income groups of the population.

3. Objectives:

To make up the protein deficiency in the diet by supplementation with oilseed and legume proteins and with limiting amino acids, such as lysine and threonine. Also to find out the availability of lysine and threonine present in cereals and millets and also of the added amino acids.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: Materials
Research

4.3 Orientation: Welfare

5. Period: March 72 - March 74.

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Identification and utilization of
carbohydrates in legumes.

2. Justification:

The object of the study is to identify and determine the extent of utilization of carbohydrates in legumes. Consumption of legumes in increased quantities is recommended for increasing the protein content in the diets of those who cannot afford to purchase protein rich foods of animal origin. Many of the legumes, are rich sources of carbohydrates; a few of them contain appreciable quantities of unavailable carbohydrates. Not much data is available on the nature of carbohydrates present in different legumes. Consumption of large quantities of legumes is known to cause digestive troubles, which has been attributed to the carbohydrate component in legumes. Literature is scanty on the nature and utilisation of carbohydrates, and this programme of work is expected to fill the gap in the information.

3. Objectives:

To identify and evaluate the utilisation of legume carbohydrates from the stand point of their effects of (i) intestinal flora, (ii) flatus production, and (iii) cholesterol metabolism.

To arrive at the optimum level of legumes that could be incorporated into diets for optimum nutrition.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Welfare

5. Period: Jan.69 - March 74

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Biochemical changes during fruit
ripening

2. Justification:

The information gained here will help evolve optimum low temperature for refrigerated storage of tropical fruits and vegetables. It will also be useful in standardising methods for transport of these perishable commodities over long distances both within and outside the country. Besides, the above will fill gaps in knowledge about fruit ripening as an important biological process.

3. Objectives:

- (i) To study the changes in content of polyphenols and the enzyme polyphenol oxidase, and the effect of polyphenols on ripening behaviour of mango and banana fruits at room temperature.
- (ii) To study respiratory behaviour of these fruits at room temperature by using whole fruits, fruits slices, mitochondria and the cytosols and other components.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: Materials
research

4.3 Orientation: Conservation

5. Period: Jan.72 to March 74.

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality Control aspects of edible
groundnut and soyabean flours with
special reference to oxidative changes
in fat.

2. Justification:

Edible oilseed flours which form the raw materials for many processed foods, contain residual fat even after solvent extraction and this is known to affect the storage stability of a food product in which it is incorporated. Hence study of suitable methods to stabilise the oilseed flours is essential.

3. Objectives:

- a) Investigations on chemical changes taking place in edible groundnut and soya flours manufactured under different processing conditions and methods of improving storage stability.
- b) Studies on lipoxidase present in groundnut and soya flours and methods for inactivation.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: Materials research,
Product research

4.3 Orientation: Conservation, raw
material utilisation.

5. Period: April 72 - March 74

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on amino acid availability
in processed protein foods.

2. Justification:

Many of the processes employed in the manufacture of protein foods usually involve heating, evaporation, pasteurization, sterilisation, dehydration and enzymic treatment. It has been shown that many of these processes result in a deterioration of protein quality leading to a lowering of nutritive value. In many processed foods, the amino acid composition does not equal amino acid availability. This problem becomes serious in the case of foods containing marginal amounts of certain essential amino acids. Data on these aspects would serve an important guideline for standardising processing conditions.

3. Objectives:

To obtain information on the availability of amino acids in processed protein foods in order to standardise processing conditions without affecting nutritive value.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: Process research
development

4.3 Orientation: Raw material
utilisation

5. Period: Jan.72 to March 74.

Discipline: Microbiology,
Fermentation Tech.
and Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Isolation of micro-organisms of public health significance from food manufacturing plants and their control by the use of sanitizers.

2. Justification:

The condition of food plant sanitation in some of the food processing industries like cashew nut processing industry, fruit and vegetable industry, cereal and dhal mill processing industry and meat, fish and poultry industry is far from satisfactory. Cashew processing industries and fruit and vegetable processing industries are earning foreign exchange to the tune of 60 and 3.3 crores of rupees respectively. In view of the economic level of the industries mentioned above, improved sanitation procedures adopted in these industries can put forth better quality products from microbiological point of view and thus increase volume of turnover.

3. Objectives:

To improve food plant sanitation procedures prevailing in some of specific food processing like cashew industry, fruit and vegetable processing industry, cereal and dhal milling processing industry and meat, fish and poultry industry.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Product research

4.3 Orientation: Export promotion, Welfare

5. Period: April 73 to March 76.

Discipline: Microbiology,
Fermentation Tech.
& Sanitation.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on microbial production of
threonine.

2. Justification:

A vast majority of population in the
developing countries depends on vegetable
source for their protein needs. The bene-
ficial effect of amino acid fortification
in upgrading vegetable proteins has been
amply demonstrated. Threonine is required
in bulk quantities for fortification of
cereals, and animal and poultry feed,
baby foods and other food formulations
based on vegetable proteins. In view of
the high cost of threonine (Rs.300/kg), it
is necessary to explore the possibility
of producing threonine by microbial method,
employing cheap raw materials.

3. Objectives:

To work out a microbial process for
economic production of L-threonine.

4.1 Nature of investigation: Application
oriented basic

4.2 Classification: Process research

4.3 Orientation: Industrial and
Economic development

5. Period: April 72 - March 73

Discipline: Microbiology,
Fermentation Tech.
and Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

A survey on the occurrence of fungal toxins in foodgrains and foodstuffs elaborated by Aspergilli and Penicillia and detailed studies on the toxic manifestations of one or two such compounds.

2. Justification:

Food materials often become carriers of a variety of toxic fungal metabolites due to fungal growth which can be a potential cause of illness & among the people, particularly affecting the growth and mental development of the vulnerable group. This danger can be averted by developing methods for their detection, elimination or inactivation to make food materials safe for human consumption. This project is planned for this purpose.

3. Objectives:

To develop simple methods for the detection of fungal toxins and for their elimination or inactivation.

4.1 Nature of the Investigation: Application oriented basic

4.2 Classification: Materials research

4.3 Orientation: Welfare

5. Period: Jan.70 - Decr.73

Discipline: Microbiology,
Fermentation Tech.
& Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Occurrence of fungal toxins in common dietary items of the population around Mangalore and incidence of liver disease like cirrhosis and hepatic cancer in the community.

2. Justification:

High humid weather around Mangalore favours fungal growth on food materials which results in the formation of toxic compounds, hazardous to the health of the community. High incidence of liver diseases in this region suggests an aetiological significance to the fungal metabolites. This has to be examined and suitable remedial measures developed to protect the community from the ravages of the toxic fungal metabolites.

3. Objectives:

To determine the type of toxins commonly present in foodgrains and develop suitable preventive measures to make them safe for human consumption.

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| 4.1 | <u>Nature of Investigation:</u> | Application oriented basic |
| 4.2 | <u>Classification:</u> | Materials research |
| 4.3 | <u>Orientation:</u> | Welfare |
| 5. | <u>Period:</u> | April 71 - March 73. |

Discipline: Industrial Research
Consultancy and
Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Relative efficiency of Randomised Block Design on weight or littermate basis over completely randomised design in animal experiments.

2. Justification:

Over the last nineteen years numerous rat feeding experiments have been carried out grouping the animals on the basis of initial weight or occasionally on littermate basis using Randomised Block Design. Littermate allotment is difficult when the number of treatments is more than three. Further, when there is a loss of observation, statistical analysis is involved. But, randomised block designs will be more efficient than completely randomised designs if weight groups or littermate groups account for a large portion of the total variation. It is, therefore, necessary to review the results of the statistical analysis of animal experiments carried out over the previous years.

3. Objectives:

To take a decision whether to continue the Randomised Block Design or change to completely randomised design in rat experiments.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: -

4.3 Orientation: Raw material utilisation

5. Period: April 72 - June 72

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Physico-chemical properties of
Indian rice varieties.

2. Justification:

Rice varieties differ in their cooking and processing behaviour. Only limited work has been done about the physico-chemical basis of such differences. Further, the comparative quality features of the various Indian varieties have not been studied fully, which hampers their optimal utilisation. For the current comprehensive breeding programmes also, basic data on desired quality features of rice are needed. These data will help in best selection and utilisation of rice for various end uses.

4. Objectives:

Elucidating the physico-chemical characteristics of Indian rice varieties, and devising suitable tests for predicting the cooking and processing qualities of rice.

4.1	<u>Nature of Investigation:</u>	Application oriented basic
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4.2	<u>Classification:</u>	Materials research
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4.3	<u>Orientation:</u>	Raw material utilisation
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5.	<u>Period:</u>	April 73 to Decr. 75.
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Discipline: Rice and Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the physico-chemical changes during parboiling and properties of parboiled rice.

2. Justification:

Advantages of parboiled rice over raw rice from nutritional, milling and storage aspects are well known. Although hygienic and engineering aspects of modernising the traditional process of parboiling have been worked out, the physico-chemical changes brought about in rice on parboiling are not yet fully understood. Such an understanding will help in diversifying the production of parboiled rice having different characteristics, its utilisation for diverse purposes and popularising it among consumers of raw rice.

3. Objectives:

To elucidate the changes in the various properties of rice and its constituents on parboiling, and to produce parboiled rice having diverse characteristics acceptable to different consumers.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials research, process research

4.3 Orientation: Raw material utilisation

5. Period: April 73 - Decr.75

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality of Spices, Oleoresins

2. Justification:

Spices form one of the major export commodities through which India earns about 29 crores of rupees per year as foreign exchange. There is continuous competition in International spice trade. Quality and strict adherence to it is very essential. Spices are generally used for their flavour quality and standards now available will ensure only minimum purity. Sensory standard must therefore be developed and each spice will require separate attention.

3. Objectives:

To develop practical and reliable methods of Sensory quality evaluation of major raw spices (pepper and ginger) and their oleoresins and to correlate to objective tests where feasible. Such evaluation when developed should become a standard for adoption as quality control from stage of production to marketing both in India and outside India.

4.1 Nature of Investigation:

Application oriented basic

4.2 Classification:

Material research, process research

4.3 Orientation:

Raw material utilisation and raw material standardisation/
export promotion

5. Period:

Jan.72 - March 79.

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on Sensory Evaluation Test
Methods and Development of Standards:
i) Ranking Test, ii) Paired and
Triangle Tests, iii) Numerical scoring
test.

2. Justification:

Agriculture production amounts to 50% of our
G N P. and food contributes a major portion
of it. Processed food products is valued at
Rs 12,410 million and export at Rs 722 million.
Government, Industries and Trades adopt
Sensory Evaluation Test Methods and use
highly trained panelists or experts. Stan-
dardising these methods will improve effi-
ciency and make panel evaluation more
objective.

3. Objectives:

To prescribe standardized test methods for
evaluation of different food products, test
problems and situations.

4.1 Nature of Investigation: Application
oriented basic

4.2 Classification: -

4.3 Orientation: To help routine
Qu lity Control
in Sensory
Evaluation of
Foods.

5. Period: Jan. 72 - March 79.

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality in Fruits and Vegetables

2. Justification:

The Export of Fruit and Vegetables exceeds slightly over 1/20 of the total production, earning Rs 49 million. The export of processed fruits and vegetables is 6,000 tons in 1967-68 fetching Rs 18 million. Study and control of quality of these foods should be of great help in increasing these exports.

3. Objectives:

To develop subjective methods and correlate them to selected objective methods for quality control for excellence and preparing draft standards of quality.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials and product research/raw materials utilisation

4.3 Orientation: Welfare/to help routine quality control in Sensory evaluation of foods/export promotion

5. Period: April 73 - March 79.

TITLES OF R&D PROJECTS FOR IV FIVE YEAR PLAN

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Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Chemical and physico-chemical studies
on seed proteins

2. Justification:

A considerable amount of work has been done in the Institute on the utilisation and isolation of seed proteins such as groundnut and sesame proteins. The work has mainly concerned itself with the technological and nutritional aspects of the problem. Basic information on the chemical and physico-chemical properties of the proteins and their fractions is needed for further developmental work.

3. Objectives:

- a) To develop better methods for the isolation of the protein.
- b) To develop methods for the preparation of protein fractions.
- c) To alter the proteins by physical and chemical means to obtain a product with the desired characteristics.

4.1 Nature of Investigation: -

4.2 Classification: Materials research

4.3 Orientation: Raw material
utilization

5. Period: April 71 - March 74

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on industrial and other useful enzymes [such as pectinase, glucamylase, catalase, protease, amylase, lipase and phosphodiesterase of rice bran, thioglucosidase of mustard and other sources.]

2. Justification:

Many enzymes are being used abroad at present in food industries. Amyloglucosidase for production of glucose from starch, pectinase for clarification of fruit juices, catalase and glucose oxidase for removal of glucose during dehydration of eggs etc, acid proteases, lipase and amylase as digestive aids. Commercial sources abroad have been marketing many of the above enzymes which are imported into India (approx. Rs.30,00,000/year).

Methods for production of some of these enzymes have been devised by the Microbiology Discipline. The enzymes are often supplied as mere crude concentrates containing more than one enzyme. Separation and subsequent sale will appreciate the economic value. Secondly some of the enzymes have not been studied earlier and hence work is necessary in this area.

3. Objectives:

Separation of pectinase from the associated enzymes, of catalase from glucamylase, and purification and study of phosphodi-esterase and lipase of rice bran.

The long range objectives are (i) to screen various biological materials including microorganisms to obtain industrial and otherwise enzymes, e.g. a better source of acid protease and amylase, lipase, glucamylase and pectinase. Cellulase-production could be most useful since cellulose wastes are apparently abundantly available and since it is a potentially inexhaustible source of glucose (fermentable sugar). Enzymes such as thioglucosidases could be used in the beneficiation of meals of oilseeds such as mustard, rape, etc. Thus there are many useful enzymes on which work could be undertaken. Hence, this project would be continued to the V Five Year Plan.

- 4.1 Nature of Investigation: Basic.
- 4.2 Classification: Materials Research.
- 4.3 Orientation: Food and Agriculture.
- 5. Period: April 1970 - March 1974.

Discipline: Biochemistry and
Applied Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Biochemical criteria associated with rodenticidal activity and application of these criteria to some new potential rodenticide compounds.

2. Justification:

Efforts are being made by the ICP Discipline to standardise formulations from compounds other than those available from commercial sources to finally get a powerful specific rodenticide which is also less hazardous to human beings and pigs. In this project, the possibilities of fixing a few biochemical criteria which could be considered along with the conventional tests in deciding the efficacy of the compounds will be investigated.

3. Objective:

(a) To obtain data to fix biochemical criteria associated with rodenticidal activity in rats.

(b) To obtain data on biochemical responses associated with rodenticidal activity in rats and mice using new compounds.

4.1 Nature of Investigation: Basic.

4.2 Classification: Materials Research.

4.3 Orientation: Food and Agriculture.

5. Period: January 1972 to March 1974.

Discipline: Biochemistry and Applied
Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Carbohydrates and Carbohydrate-protein complexes
in black gram (Phaseolus mungo).

2. Justification:

The Black gram is an important ingredient of the composite flour mixes used for the preparation of idli (fermented rice-blackgram pudding). Its main role appears to be in contributing the gas holding and textural components apart from fermentation substrates and flavour precursors. An understanding of the chemical nature and physico-chemical properties of these constituents would lead to a better understanding of the texture of the food products and lead to their application in newer types of food products and also developing new texture-producing substances.

3. Objectives:

(i) Isolation and characterisation of the components responsible for the gas holding and other special textural characteristics of blackgram manifested in leavened, savoury and confectionery food preparations containing the legume flour.

(ii) Understanding the chemical nature of the constituents responsible for the special textural characteristics of certain food preparations and producing them in concentrated form or synthetically for use in processed foods.

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| 4.1 | <u>Nature of Investigation:</u> | Basic. |
| 4.2 | <u>Classification:</u> | Materials Research. |
| 4.3 | <u>Orientation:</u> | Rawmaterial utilisation. |
| 5. | <u>Period:</u> | January 1971 to March 1974. |

Discipline: Biochemistry and
Applied Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on early nutritional deficiency: (a) Effect of vitamin A deficiency on lipids of central nervous system (b) Metabolism of vitamin A and the nature of urinary oligosaccharides.

2. Justification:

(a) It has been suggested that early malnutrition can lead to irreversible changes in central nervous systems (CNS). In cases of kwashiorkor, mental apathy of the children has been one of the consistent factors. After suitable therapy, by supplement of good quality protein and calories in adequate amounts, the recovery in terms of restored growth, disappearance of oedema and serum albumin regeneration have been recorded. However, possible damage to the CNS and hence of learning ability might not be equally well reversed. The incidence of vitamin A deficiency concomitant with protein calorie malnutrition is high and is well documented.

(b) Our earlier studies (Proj.175) on vitamin A deficiency on the metabolism of glucose-U-C14 showed that the incorporation of 14C into tissue acid polysaccharides and lipids was increased in the deficient animal. Also Sephadex-G-50 chromatography (gel filtration of urine revealed a distinctly different distribution of radio activity and the number of oligosaccharides excreted by the vitamin A deficient rat. This indicates that in the vitamin A deficient state, the catabolic breakdown products of tissue polysaccharide excreted is distinctly different from the normal. Moreover a role for vitamin A on synthesis of intestinal glycoproteins has been postulated (L.Deuca et al., J.Biol.Chem., 244, 701, 1969).

3. Objectives:

To investigate specifically in laboratory animals the effect of early malnutrition (with respect to vitamin A) on the composition of the lipids and non-lipid portions constituting the CNS, and whether any qualitative and quantitative changes produced are reversed on appropriate nutritional rehabilitation. To study specifically the effect of early vitamin A deficiency on the lipids and other constituents of the central nervous system, coupled with studies on membranes of other tissues such as liver, intestines and kidneys.

Long range objectives are: (i) to study the developmental aspects of brain constituents and study the effects of malnutrition (in utero and during the critical period of brain growth) on lipids and associated components in by nutritional rehabilitation at selected points of growth (iii) possible correlation of changes in brain lipid components with function (iv) to characterise vitamin A catabolic and products and the excreted oligosaccharides in the vitamin A deficient state.

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| 4.1 | <u>Nature of Investigation:</u> | Basic. |
| 4.2 | <u>Classification:</u> | - |
| 4.3 | <u>Orientation:</u> | Welfare. |
| 5. | <u>Period:</u> | April 1970 to March 1974. |

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Biochemical investigations on the toxic factors present in guar bean and other seeds.

2. Justification:

This work is a continuation of the work being done in Project No.261. Work on this could actually be started only by July 1971 due to difficulties in procuring fresh raw materials. Hence, the work will be continued for one more year.

The aim of the project has been to separate and study the nature of the toxic factors present in the guar beans. These toxic factors could be either extracted with 80% ethanol or one of them concentrated and bound to protein during the preparation of the protein isolate. Some methods to prepare a toxin-free protein meal have been standardized by the Protein Technology Discipline.

3. Objectives:

To obtain further data for assessing the toxic nature of fractions prepared from the seeds.

The results obtained may lead to quick assessment of toxic-free nature of the processed guar meal.

4.1 Nature of Investigation: Basic.

4.2 Classification: -

4.3 Orientation: Food and Agriculture,
Welfare.

5. Period: April 1972 to March 1974.

Discipline: Biochemistry and
Applied Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of variation in calorie intake and protein intake on growth and body composition of normal and protein depleted rats.

2. Justification:

The efficacy with which dietary protein promotes growth depends primarily on (a) total calorie intake, and (b) quality and quantity of dietary protein. There is evidence to indicate that various processes like growth, tissue synthesis, etc. proceed effectively only when adequate calories are supplied in the diet. In most of the under-developed countries, under-nutrition and protein-calorie malnutrition are widespread, due to variation in the diets which lowers the nutritional status to a low ebb. Changes occurring in the body under these conditions of nutritional deficiencies will be different as compared to under-nutrition or changes occurring in normal conditions.

3. Objectives:

To study effects of protein-calorie variation in normal and protein depleted rats. Experimentally produce kwashiorkor and marasmus in rats and study changes occurring in these conditions.

To determine the optimum protein calorie ratio needed in diets of the normal and under-nourished groups of population and optimum calories required for maximum protein utilization under these conditions.

4.1 Nature of Investigation: Basic.

4.2 Classification: -

4.3 Orientation: Welfare.

5. Period: January 1972 to March 1974.

Discipline: Biochemistry and
Applied Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Blood amino acids in evaluating the quality of
legume proteins.

2. Justification:

Legumes are important sources of proteins in Indian diets.
Hence, assessment of their nutritive value is of scientific
and practical importance.

3. Objectives:

Studies with a variety of animals have shown that measure-
ment of blood amino acid levels is particularly effective
in predicting the limiting amino acid in the dietary pro-
tein. In this project, studies will be carried out to
determine the limiting amino acids in common Indian legumes
and protein foods containing legumes, from blood amino acid
measurements and rat growth experiments.

The most important sources of proteins of vegetable origin
for supplementing diets based mainly on cereals are the
edible legumes and protein foods based on cereals, legumes
and oilseed meals. A knowledge of the limiting amino acids
in these foods will result in the development of high-quality
protein-rich formulations.

4.1 Nature of Investigations: Basic.

4.2 Classification: -

4.3 Orientation: Welfare.

5. Period: September 1969 to March 1974.

Discipline: Biochemistry and
Applied Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Regulatory enzymes in the biosynthesis of threonine and other amino acids of aspartate family.

2. Justification:

Threonine is one of the amino acids which is nutritionally deficient in rice and addition of threonine and lysine to rice renders it a good protein. A project on threonine-fermentation is in progress in the Microbiology Discipline. The work envisaged here hopes to provide the necessary information to understand and possibly control and improve threonine secretion by microorganisms. Besides, there is little information available concerning the control of biosynthesis of threonine and related amino acids in plants.

3. Objectives:

i) To study (isolate, purify and study the properties of) homoserine dehydrogenase, homoserine kinase, threonine synthetase of Serratia marcescens and other strains of bacteria (which secrete some threonine).

ii) To study the above enzyme systems involved in the biosynthesis of the aspartate family amino acids in bacteria and in plants, and how they are regulated particularly in plants (common legumes).

4.1 Nature of Investigation: Basic.

4.2 Classification: -

4.3 Orientation: Welfare.

5. Period: April 1970 to March 1974.

Discipline: Training Centre.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on changes in lipids of coconuts in combination with other ingredients in various mixes.

2. Justification:

Many of the products in which dried coconut forms an ingredient do not keep well on storage under high temperature conditions. Some of the traditional foods have coconut as an ingredient. To improve their stability, it is necessary to study the changes in lipids of coconut as such and in combination with the other ingredients as an application oriented basic study.

3. Objectives:

To study the mechanism of reaction and changes in lipids of coconuts as such and in combination with ingredients like spices, flavours etc.

4.1 Nature of Investigation: Basic.

4.2 Classification: Not applicable.

4.3 Orientation: Raw material utilisation.

5. Period: March 1972 to March 1974.

Discipline: Training Centre.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Non-enzymatic discolouration in Citrus Squashes.

2. Justification:

In the year 1969 about 6000 tonnes of squashes, syrups, nectars, etc., valued at Rs.1.8 crores were produced. Citrus squashes notably orange and to some extent lime and lemon squashes form the bulk of the fruit juice based beverages produced in the country. These citrus squashes develop nonenzymatic brown colour during storage which impairs their acceptability and hence of serious concern to the processors. An understanding of the causes for this discolouration would help in evolving suitable measures for their control.

3. Objectives:

To study the mechanism of nonenzymatic browning in citrus squashes with a view to evolve suitable measures to control the same.

4.1 Nature of Investigation: Basic.

4.2 Classification: -

4.3 Orientation: Product improvement.

5. Period: January 1972 to December 1974.

Discipline: Training Centre.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on non-enzymatic discolouration in canned and dried fruits and vegetables with reference to cabbage, banana and guava.

2. Justification:

Nearly 9000 tonnes of canned and dehydrated fruits and vegetables valued at Rs.2.5 crores are produced annyally at present. Development of pink discolouration in canned fruits like pear, guava, banana etc. and vegetables like Cabbage, Cauliflower, beans, certain varieties of peas etc., has been a serious concern to the canners. Non-enzymatic browning in dried vegetables has also been a serious problem. The problem of discolouration is world-wide and has defied solution; and hence the need for study.

3. Objectives:

To study the mechanism of pink discolouration in canned guava, banana and cabbage and of browning in dried vegetables with a view to develop suitable measures for control. This will help in better utilization of raw materials, produce wholesome and attractive product and increase the production.

4.1 Nature of Investigation: Basic.

4.2 Classification: -

4.3 Orientation: Improvement of quality.

5. Period: January 1972 to March 1974.

Discipline: Sensory Evaluation.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Nature and Elimination of Residual aroma in the utilization of Oilseed flour and Protein isolates.

2. Justification:

Extent of protein requirement can be judged from the children under 6 years (22%) and pregnant and lactating mothers form (50%) the most vulnerable group of the population. As potential protein source, India produces about 6 million metric tonnes of groundnut and 0.6 million metric tonnes of sesame. One of the inherent defects in the utilization of oilseed flour or their protein isolate is the problem of residual off-flavour. This problem is aggravated wherever the process of wet cooking is involved in their utilization.

During the exploratory work on residual off-flavour of groundnut flour, mixed solvent extraction and with fungal enzymes treatment of the flour greatly reduced the off-flavour. A detailed study of the nature of off-flavour and processing to eliminate the raw residual off-flavour will lead to better utilization of oilseed protein in various food formulations. The study will be on processing and stabilising of groundnut flour and protein.

3. Objectives:

i) To study the nature of off-flavour compounds and to eliminate the objectionable off-flavour in products containing oilseed flour and protein isolates.

ii) Build up facilities to work on flavour problems of fatty foods.

4.1 Nature of Investigation:

Basic.

4.2 Classification:

Materials and Product Research.

4.3 Orientation:

Raw material utilization.

5. Period:

January 1972 to March 1974.

TITLES OF R&D PROJECTS PROPOSED FOR

V FIVE YEAR PLAN

"RESEARCH UTILIZATION"

Sl. No.	Title	Page
1.	Economic utilization of lime fruits and wastes with special reference to the production of lime oil and lime juice products.	.. 168
2.	Extension work on harvesting, handling, treating, packing, transportation and storage of robusta variety of bananas for export from the coastal regions.	.. 169
3.	Non-toxic grain protectants, screening different materials to develop suitable tanks for activation of clays..	170
4.	A new orientation for an expeditious application of disinfestation techniques in villages by creating opportunities to rural unemployed for self-employment through Agricultural commodity Storage Service.	.. 171
5.	Production of different processed fish-oil for use in food industries (pilot plant scale study).	.. 172
6.	Production of fish protein hydrolysates on a pilot plant scale.	.. 173

Discipline: Fruit and
Vegetable Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Economic utilization of limefruits and wastes with special reference to the production of lime oil and lime juice products.

2. Justification:

The production of lime fruit in the country is estimated to be 3,50,000 tonnes. About 27% of the total area under citrus fruits are occupied by lime alone. At present only 1,000 tonnes of fruits are used by the industry. Very valuable commodities like lime oil, pectin from peels, and citrates or citric acid from juice can be produced for the economic utilization of this crop. There are indications of demand for 50 tonnes of lime oil valued at 40 lakhs rupees for internal/export market. During 1969-70, 1.6 tonnes of lemon oil valued at Rs.3.6 lakhs was imported into the country. Calcium citrate or citric acid are also in good demand in the country and are being imported. About 1,300 tonnes of citric acid valued at Rs.48 lakhs and 665 tonnes of calcium citrate for conversion into citric acid was imported during the year. Efforts made in this direction for utilizing all the valuable products from lime will bring considerable savings in foreign exchange by import substitution and export promotion.

3. Objectives:

- i) To stop imports of lemon oil, citrates and citric acid.
- ii) To promote export of lime oil, lime juice concentrates and pectin.
- iii) To make full utilization of the lime produced in the country.
- iv) To promote agro-industries and improve employment potential.

4.1 Nature of Investigation:

Research utilization.

4.2 Classification:

Process research, product research, extension.

4.3 Orientation:

Import substitution, export promotion, wastage utilization, raw material utilization, promotion of agro-industries and employment potential.

5. Period:

April 1975 to March 1979.

Discipline: Fruit & Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Extension work on harvesting, handling, treating, packing, transportation and storage of robusta variety of bananas for export from the coastal regions.

2. Justification:

The collaborative experiment with IIR, Hesaraghatta, on the handling, transportation and storage of robusta variety of bananas on the first crop and subsequent first and second ratoon crops will be completed. Conditions for the harvesting, transportation and storage are expected to be standardized by March 1974. Based on the above results, export of trial shipments of this variety is envisaged.

3. Objectives:

To carry out extension work for export of Robusta variety.

4.1 Nature of Investigation: Research Utilization.

4.2 Classification: Extension.

4.3 Orientation: Export promotion.

5. Period: July 1974 to July 1979.

Discipline: Infestation Control & Pesticides.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Non-toxic grain protectants: Screening different materials to develop suitable tanks for activation of clays.

2. Justification:

Activated clays have a tremendous potential for use as safe insecticides in grain storages. However, they should be produced economically so that they are freely available to grainmen. A variety of clay minerals are to be evaluated to suit specific storage conditions and grain types. Large scale production using inexpensive, locally available materials has to be started without any delay.

3. Objectives:

To develop inexpensive, efficient acid activation tanks for bulk-handling and speedy production of insecticidal clays.

4.1 Nature of Investigation: Research Utilization.

4.2 Classification: Materials and Process research, design and fabrication.

4.3 Orientation: Conservation/Export Promotion.

5. Period: April 1974 to March 1976
(The exploratory work on this would be taken up in 1973.)

Discipline: Industrial Research,
Consultancy & Extension.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

A new orientation for an expeditious application of disinfestation techniques in villages by creating opportunities to rural unemployed for self-employment through Agricultural commodity Storage Service.

2. Justification:

The storage in villages accounting for nearly 70% of total production in foodgrains is susceptible to heavy damage by insects, rodents and moulds. The qualitative and quantitative losses are very heavy and at the current rates of production preventable loss even at the minimum may amount to 70,00,000 tonnes valued at about Rs.700,00,00,000.

3. Objectives:

In order to prevent the above damage it is essential to apply the disinfestation techniques developed by the Institute expeditiously in all 566,000 villages in the country. It is proposed to train suitable unemployed youths so that they could extend the disinfestation service at the same time ensuring a gainful employment for themselves.

4.1 Nature of investigation: Research utilization.

4.2 Classification: Extension.

4.3 Orientation: Conservation and in effect import substitution also.

5. Period: April 1974 to March 1979.

Discipline: Experiment Station,
Headquarters.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Production of different processed fish-oil for use
in food industries (Pilot Plant Scale Study).

2. Justification:

Production of fish oil from mechanised fish meal and
oil units is expected to be about 10,000 tonnes in the
fifth plan period. The fish oil thus produced can be
put into better uses with more economic returns, if it
is subjected to different processing methods such as
winterisation, interesterification, hydrogenation, etc.

3. Objectives:

- i) To scale up processes worked out at laboratory level
to pilot plant levels.
- ii) To help to develop a fish oil processing industry in
India.

4.1 Nature of Investigation: Research Utilization.

4.2 Classification: Process Research.

4.3 Orientation: Raw material utilization.

5. Period: September 1975 to May 1978.

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Production of fish protein hydrolysates on a
pilot plant scale

2. Justification:

Seasonal gluts of marine fish find only a limited industrial use by conversion into fish meal or salted and sun-dried fish. Quite a substantial fraction (20,000 tons in Mysore State) of oil-sardine catch during season is converted into guano and fish manure. Also miscellaneous varieties of fish caught by mechanised boats (20% total marine landing, about 240,000 tons) is not properly utilised. Fish proteins are comparable to animal proteins in their amino acid make up and form excellent raw materials for production of fish protein hydrolysate. This would give an alternative use for surplus fish

3. Objectives:

1. To prepare fish protein hydrolysates on a pilot plant scale for human consumption and industrial use as bacteriological media component.
2. To provide the basis for a new industry based on fish as raw material

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|-----|---------------------------------|--------------------------|
| 4.1 | <u>Nature of investigation:</u> | Research Utilization |
| 4.2 | <u>Classification:</u> | Product Research |
| 4.3 | <u>Orientation:</u> | Raw material utilisation |
| 5. | <u>Period:</u> | April 1975 to March 1979 |

TITLES OF R&D PROJECTS PROPOSED FOR V FIVE YEAR PLAN

"APPLIED RESEARCH"

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20. Convenience Foods for the Indian Household:III Formulating ready mix powders for (i) Spiced <u>chutney</u> , (ii) Dry pulse-spice adjunct for <u>Tamarind Bhath</u> (Puliyogarai), (iii) Jangiree (a sweet preparation based on blackgram) and (iv) Deep fried crisp products like <u>Thengolal</u> , <u>Pakoda</u> , etc. (based on cereal-pulse mixtures)	200
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97.	Development of nutritious high protein ready mixes for traditional Indian sweets and savouries	279
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Discipline: Plantation Products and
Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of comprehensive improved procedure
for cashewnut processing

2. Justification:

During IV Plan advance action has been taken to
develop equipment for processing and also to improve
the technology. During V Plan efforts to apply the
findings and upgrade the efficiency and productivity
will be undertaken

3. Objectives:

To initiate improved design of machinery and process
technology in the industry. Improvements in condi-
tioning, decortication, drying, grading and packaging
will be applied.

4.1 Nature of investigation: Applied

4.2 Classification: Process research, Product
research and design and
fabrication

4.3 Orientation: Export Promotion

4.4 Collaboration: Discipline of Process
Development & Design

5. Period: April 1974 to March 1979

Discipline: Plantation Products and
Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Diversified uses of Coffee

2. Justification:

With the increasing production of coffee in the country, it is necessary to find more diversified uses of coffee by improving the technology of production, preparation of new products with varying combinations like coffee-cocoa products, cardamom coffee, coffee aroma encapsulated protein products etc.

3. Objectives:

To explore the possibilities of applying agglomeration, instantizing and encapsulation techniques for incorporating coffee into various acceptable products and beverages.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research/Product Research

4.3 Orientation: Export Promotion and better utilization

4.4 Collaboration: Discipline of Process Development and Design

5. Period: April 1976 to March 1979

Discipline: Plantations Products and
Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Instant Tea from unfermented and semi-fermented
green tea leaf

2. Justification:

On account of the demand for sophisticated products like instantly soluble teas in the world market during the coming years, a diversification in the Indian Tea Industry by way of production of instant green tea, instant Oolong tea etc., will increase further the foreign exchange earning capacity of the Indian tea industry. The technical know-how for these products have to be developed in order to help the local tea industrialists

3. Objectives:

To produce new products like Instant Green Tea and Instant Oolong Tea for export to the existing as well as new markets; to subject the product to organoleptic evaluation and wide consumer acceptance especially in the consuming countries; to prepare a project engineering report on the process and to help the industry in setting up a production plant.

4.1 Nature of investigation: Applied

4.2 Classification: Process research,
Product Research

4.3 Orientation: Export promotion

4.4 Collaboration: Discipline of Process
Development & Design

5. Period: April 1974 to March 1976

Discipline: Plantation Products and
Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the variation in quality of tree spices,
leafy spices and spice blends

2. Justification:

A distribution of over two lakhs seedlings of tree spices have been reported in regions of Kerala, Mysore, Andaman & Nicobar islands during Fourth Plan period. These spices will be available for marketing during Fifth Plan and hence the industry will require technical assistance in varietal selection, processing and packaging. At present, these spices are being imported.

3. Objectives:

Collection of authentic samples of each of the above spices and analysis for their chemical composition to be carried out. Processing and quality aspects will be worked out. Production and standardization of spice blends will be undertaken besides development of suitable equipment for the same.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research, Process Research

4.3 Orientation: Export promotion, raw material utilization

4.4 Collaboration: Discipline of Process development & Design

5. Period: April 1976 to March 1979

Discipline: Plantation Products
and Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of Cocoa: Curing - Drying

2. Justification:

Cocoa production is increasing and our import of 1000 tonnes may be stopped during V Plan. Problems of planters in curing, drying, quality control at the infancy of the industry are to be solved

3. Objectives:

To study the curing and drying problems in the processing of cocoa under our conditions, to develop products based on cocoa and quality control of cocoa beans

4.1 Nature of investigation: Applied

4.2 Classification: Process/Product Research

4.3 Orientation: Import substitution;
raw material utilisation

5. Period: April 1974 to March 1977

Discipline: Plantation Products and
Food Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of extractives from leafy spices
and spice blends

2. Justification:

During the IV Plan, production of oleoresin from minor
spices would have been established in the country. The
next phase of development is to help them to diversify
their production to leafy spices and compounded blends
for specific industries.

3. Objectives:

To produce acceptable extractives from leafy spices
and to compound flavour for food industries utilizing
oleoresin from different spices.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Export Promotion

4.4 Collaboration: Discipline of Process
Development & Design

5. Period: April 1976 to March 1979

Discipline: Plantation Product and
Flavour Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation of flavour blends for meat, fish
and poultry products.

2. Justification:

The present capacity of production for meat is reported to be 1,600 tonnes whereas the existing production is only half of that. During the IV Plan the industry will establish itself and in V Plan product development with improved flavours will be essential. To suit the various consumer preferences suitable flavour blends will be a need

3. Objectives:

Preparation of suitable flavour blends for meat, fish and poultry

4.1 Nature of investigation:

Applied

4.2 Classification:

Product Research

4.3 Orientation:

Raw material utilisation

5. Period:

April 1977 to March 1979

Discipline: Infestation Control and
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Household insecticidal dust formulation for use in
puffer-packs

2. Justification:

Household insecticidal puffer-packs are in the market. They contain organic phosphate insecticides and hence are to be used with great caution in homes. A product which is safe to use and that does not prove hazardous even if accidental contamination of foods occurs would be a boon to the housewife

3. Objectives:

To develop suitable safe insecticidal formulations incorporating activated clays, synergized pyrethrum or any other plant product that is insecticidal. The project would be linked to other investigational projects on active clays and plant insecticides

4.1 Nature of investigation: Applied

4.2 Classification: Material Research/Product
Research

4.3 Orientation: Substitution of toxic
chemicals/welfare

5. Period: April 1978 to March 1979
(spills over to VI Plan)

Discipline: Infestation Control
and Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Granular formulations for gas absorption
(fumigants) using sorptive minerals

2. Justification:

The most used material for gas-absorption is activated charcoal, which is very expensive and is often imported. Canister containing activated charcoal are used in fumigation operations to protect the pest control operators. Suitable formulations based on sorptive minerals such as clays would be a great stride in providing a substitute for the expensive activated charcoal. Treatment of factory effluents to prevent air-pollution is a possibility

3. Objectives:

Screen active clays - with permutations and combinations of other sorptive substances such as low grade charcoal etc. to arrive at a proper formulation for use as a cannister mass for fumigant absorption

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research/
Product Research

4.3 Orientation: Defence/Import substitution/
Export promotion/Raw
material utilization

5. Period: April 1976 to March 1979

Discipline: Infestation Control and
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of selective rodenticides and improvement of anticoagulants for the control of warfarin - resistant rodents

2. Justification:

Losses caused by rodents on food crop and stored grains have been recognised by the planners, legislators, scientists and variously calculated ranging 2.4% to 25% of the foodgrain produced in the country. With the increasing use of pesticides, to combat the pest, there is every likelihood of the development of drug-resistance problems. This phenomenon can be well exemplified by the incidence of warfarin-resistant rats in U.K., Denmark and recently in the U.S. In India also warfarin resistant rats have been observed. Newer synthetic organic chemicals are to be screened and developed before a large proportion of the population become resistant to a currently used rodenticide. There is a need to reexamine the principles and concepts of pest control measures, resistance problems, selection, optimal dosage, type of formulations of the currently employed compounds, with the changing patterns of environments and pests. New rodenticides are to be developed as a matter of high priority to avoid some of the above problems. As a precautionary measure, additional research is necessary to learn about the present resistance situation from the view points of genetical and physiological aspects. Improvement of existing rodenticides and developing newer agents for rodent control from indigenous resources are required for protection of foods, health and wealth.

3. Objectives:

- i) To survey and to study the chemical resistance problems among rodent population
- ii) To increase the mammalian safety factors thus avoiding or reducing the secondary poisoning.
- iii) To screen chemical and microbial sources of rodent control agents to keep ahead of the resistance problem in a rodent population
- iv) To develop and manufacture effective anticoagulant bait formulations

- 4.1 Nature of investigation: Applied
- 4.2 Classification: Material/Product Research
- 4.3 Orientation: Import substitution,
Food & Agriculture
5. Period: March 1975 to March 1979



Discipline: Infestation Control
and Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development and evaluation of newer chemicals as grain protectants during storage of grain

2. Justification:

Based on our data of PL-480 project (Control of microflora), use of safer chemical protectants to control both microorganisms and their metabolite will go a long way in conserving grain during storage.

3. Objectives:

Both in small and bulk storage, the life and microbiological quality of grain are dependant on the moisture content of grain in addition to other factors. Hence, attempts will be made to employ new safe chemical protectants to control both microorganisms and their metabolites during storage of grain.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Conservation

5. Period: April 1975 to April 1979

Discipline: Infestation Control and
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Control of Toxigenic Microorganisms in foodstuffs

2. Justification:

Microorganisms have been recognised as a major cause of loss of quality in foodstuffs. Providing clean, safe foods is the responsibility of governments in order to protect the public health. The food producer or packer is expected to use only clean, safe, wholesome raw materials. He is expected to process foods under sanitary conditions so that they may not be contaminated with harmful bacteria or fungi. The project has been formulated taking into account the above considerations

3. Objectives:

- (a) Development of chemical methods of control of microorganisms
- (b) Adoption and application to practical conditions in industry

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research/Process Research

4.3 Orientation: Sanitation and Public Health

5. Period: April 1974 to March 1977

Discipline: Infestation Control and
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of methods of dispensing fumigants and their formulations to suit the food industry, rural and domestic storage conditions

2. Justification:

Unitized packages of foods would be the trend in the future in the country (as in Western Countries). In package fumigation on the production line, fumigation of individual crates and cartons, fumigation of domestic larders and department stores require special fumigant formulations and dispensing techniques. The project envisages developments in the above lines.

3. Objectives:

As above

4.1 Nature of Investigation: Applied

4.2 Classification: Product research/
materials research

4.3 Orientation: Conservation

5. Period: April, 1977 to March, 1979

Discipline: Rice and Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Screening of Cereal grains (Rice & Jowar)
for high protein quality and with special
reference to limiting essential amino
acids.

2. Justification:

Quantitative and qualitative deficiency of
protein has been recognised as a major
dietary deficiency in India and other developing
countries. Among the many approaches to solve
the problem, developing high protein varieties
of cereals and millets with a high content of
lysine, threonine and methionine is a direct and
lasting approach. Finding suitable parent
materials from the cereal breeders stock of pure
strains and identifying promising strains during
and after the breeding programme is a very
important aspect deserving study.

3. Objectives:

- i) Analysis of protein, and the deficient amino
acids lysine, threonine and methionine in
general breeder's stock of rice and jowar and
also in the F_2 and early segregating varieties
after the breeding work has commenced.
- ii) Bioassay and processing quality study on
promising varieties.

- 4.1 Nature of Investigation: Applied
- 4.2 Classification: Materials Research
- 4.3 Orientation: Food and Agricultural
and Welfare
- 5. Period: April, 1974 - April, 1979

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process standardisation and mechanisation of the process for making indigenous type of rice flakes (Avalakki, Aval or beaten rice).

2. Justification:

Production of 'Beaten rice' is the most important rice product industry, with an annual turnover of 2 million tonnes valued at Rs.3,000 million. It is an important raw material for preparation of several sweet, savoury and deep fried crispy rice products. The process enables use of whole rice without polishing and no separate milling is involved. It is a fairly inexpensive national semi-convenience rice product. Process improvement and some mechanisation for reducing cost and severity of human labour are necessary to be affected.

3. Objectives:

- i) Control of the soaking step to minimise breakage during flaking
- ii) Mechanising the roasting step
- iii) Making the flaking a continuous one

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research &
Design & Fabrication

4.3 Orientation: Conservation

5. Period: June, 1975 - June, 1978

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

- Operational and Design improvements for better functional efficiency and production economy of new type modern dhal mill.

2. Justification:

Losses amounting to 3-5% of dhal are obtained in the improved dhal milling methods. This could be avoided by further improvement of methods and machinery. The cost of production also could be reduced further. There is also a need for recovery of germ lost during splitting.

3. Objectives:

To improve the operational efficiency and design of machines for higher recovery of dhal and germ from pulses.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research, Design and Fabrication

4.3 Orientation: Development (Industrial and economic) and wastage minimization

5. Period: April, 1974 to March, 1977

Discipline: Rice & Pulse Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Rationalization of methods and machinery
for the economic production of puffed
Bengal Gram

2. Justification:

The yield of puffed bengal gram by
traditional methods and machines is low
although an improved puffing machine has
been introduced. The losses are estimated
to be about 20% annually.

3. Objectives:

To study the traditional methods and
machinery employed in the commercial
production of puffed bengal gram and their
improvement for better quality and higher
yield.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Wastage minimi-
zation

5. Period: April, 1977 - March, 1979

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Improvements in the Process for Puffing paddy/rice for increased yield and better quality of puffed product.

2. Justification:

About 1 million tonnes of paddy valued at Rs.750 million are being puffed in India. The puffed product is used for making traditional sweets, deep fried crisp products and also as a ready-to-eat product. The puffed product prepared from rice is also a popular All India snack and is prized for its porous crisp texture.

Both these products are being made by traditional methods employing sand roasting over a hot Bhatti and is a batch process using 1 or 2 Kg. per batch of roasting. The traditional methods need to be scientifically examined, improved and mechanized for getting more yield of the products, higher puffing volume increase and for effecting quality control during the puffing.

3. Objectives:

- i) Standardisation of optimal conditions for obtaining maximum puffing volume increase
- ii) Search for waxy or semi-waxy varieties that give both high percentage of puffed grains.
- iii) Mechanizing the process with a view to avoid the sand roasting and making it continuous if possible.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Economic Development & Welfare & Wastage minimization

5. Period: April, 1976 to March, 1979

Discipline: Rice & Pulse Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of Ragi for better Consumer Acceptability and for Diverse Culinary Uses

2. Justification:

Ragi is the most important among the minor millets of India. The annual production for 1970 was estimated at 2.2 million tonnes, the chief producing states being Mysore, Tamil Nadu, Andhra Pradesh, Uttar Pradesh and Orissa. It has the distinction of having the highest (0.4%) calcium content among the foodgrain known. The grain is considered highly sustained by the labour population accustomed to it. It is not, however, popular among the general public for two reasons. Firstly, most cultivated varieties are highly coloured and have a high crude fibre content. Dumping or Mudde prepared from it is very highly pasty and sticky and the taste is, therefore, not realised. Rotis prepared from the flour become tough and chewy on cooling.

It is, therefore, necessary to remedy the above defects by suitable processing techniques. Some exploratory work (Ad hoc project No.6 - parboiling of Ragi) carried out in this Institute has shown that the project is feasible and is likely to yield practical results of value.

3. Objectives:

- i) To standardize appropriate and practicable wet or dry heat treatment procedures for reducing the pastiness of ragi preparations.
- ii) To study the suitability of raw and processed ragi flour for traditional deep fried, pan baked and fermented preparations.
- iii) Production of processed and refined ragi flour with minimum husk and crude fibre and with minimum loss of essential nutrients.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Economic development and welfare

5. Period: April, 1975 - March, 1976

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Convenience Foods for the Indian Household:
III. Formulating Ready Mix Powders for
(i) Spiced chutney, (ii) Dry pulse-spice
adjunct for Tamarind Bhath (Puliyogarai),
(iii) Jangiree (a sweet preparation based
on blackgram) and (iv) Deep fried crisp
products like Thengolal, Pakoda, etc.
(based on cereal-pulse mixtures).

2. Justification:

Indian culinary art has developed numerous
tasty and highly enjoyable products. However,
making of these products is a very tedious
process involving labour and time. Recipes are
sometimes a secret and also highly unstandar-
dized. Increased urbanization and industria-
lization of the country has necessitated
convenience foods, which can save time and
labour and can give standardized products that
can be produced in bulk at a central place.

Ready mixes for some of the most important
national household dishes like Idli, Dosa,
Vadai, Jelobi, Jamun, Chakli, Muchorai, Rasam,
Sambar, etc. have been developed earlier at
this Institute. Many of these have also been
produced commercially. It is proposed now to
take up formulation work on the other products
mentioned above which are quite difficult to
prepare for the housewife. Some preliminary
and explorative studies carried out at this
Institute (Project No.37 and 249) have indicated
that it would be possible to make satisfactory
formulations for the above.

3. Objectives:

(i) Development of formulations in the form
of composite dry ready mix flour for making the
above preparations.

(ii) Standardization of the recipe composition
to have at least a minimum consumer acceptabi-
lity standard.

(iii) Packaging studies on these mixes in
suitable packaging materials to have a shelf-
life of at least 6 months.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Industrial & Economic
Development

5. Period: April, 1975 to March, 1979

Discipline: Rice & Pulse Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Conditions of drying of raw and parboiled paddy for optimum milling quality

2. Justification:

Milling quality of paddy is profoundly influenced by the conditions of its drying; improper methods of drying lead to extensive breakage of rice on milling. There is at present much avoidable breakage of rice in India, which can be eliminated or reduced by proper drying, with consequent economic and quality improvement. With progressive introduction of mechanical dryers in India, determination of the optimal conditions of their operation has become essential.

3. Objectives:

To study the drying characteristics and optimum conditions of drying of raw and parboiled paddy by various dryers for best milling results.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials Research/
Process Research

4.3 Orientation: Wastage prevention/
conservation

5. Period: April, 1976 - Dec. 1978

Discipline: Rice & Pulse
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on breakage of rice during milling.

2. Justification:

Present production of rice in the country is over 40 million tonnes, out of which about 1/3 is milled commercially. Substantial proportion (10-50%) of this rice undergoes breakage during milling, leading to corresponding losses in rice recovery as also in economic value of the product. Prevention or reduction of this breakage will lead to very considerable economic returns. Some information is available in the literature about the causes of rice breakage during milling. But a comprehensive study on the various factors involved (cracked kernels, immature kernels, moisture content, kernel shape and size, infestation, kernel hardness, milling machinery, etc.) is desirable.

3. Objectives:

To elucidate the various causes of rice breakage during milling, their relative importance and interrelations, and methods of their prevention.

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|-----|---------------------------------|-------------------------------------|
| 4.1 | <u>Nature of Investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Materials Research |
| 4.3 | <u>Orientation:</u> | Wastage prevention/
conservation |
| 5. | <u>Period:</u> | April, 1976 - Dec., 1978 |

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Canning trials of green pepper and chillies.

2. Justification:

It is reported that nearly 1,20,000 tonnes of green pepper and 40,000 tonnes of dried chillies are annually grown in the country. There have been a number of enquiries regarding conditions for canning of these two commodities as there is flourishing market abroad for these items.

3. Objectives:

The objective is to find a suitable method for canning these commodities so as to retain the green colour to the maximum extent.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Export promotion

5. Period: April, 1977 to
March, 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of optimum conditions for storing fresh tropical fruits under controlled atmospheres.

2. Justification:

India produces 11.84 million metric tonnes of tropical fruits (Mango 7.5, Banana 3.1 and Citrus and others 1.24). These tropical fruits have a very short storage life under tropical climatic conditions. Low temperature storage of tropical fruits is attended by loss of ripening quality, flavour, colour, chilling injury and microbial spoilage. Many commercial varieties of mango like Alphonso, Dasheri and Banganapally have a very good export market. During 1975-76, 10,000 tonnes of mangoes valued at Rs.13 million are expected to be exported. If this is to be achieved, controlled atmosphere storage at room temperature has to be tried which may solve problems of chilling injury and loss of ripening quality. Similar studies have been successfully conducted on apples and is being practised in advanced countries.

3. Objectives:

Deriving suitable composition of gas mixtures and conditions of storage which are not injurious to normal ripening behaviour of the fruit. Extension of storage life of mangoes for export at room temperature or in combination with mild refrigeration.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials/Process/
Design & fabrication research

4.3 Orientation: Export Promotion

5. Period: March, 1975 - March, 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Cultivation of mushrooms for internal
trade

2. Justification:

There are many varieties of mushrooms which cannot be grown artificially under the climatic conditions prevalent in Mysore, unless an air-conditioned room is provided which is economically not feasible if it is done on a commercial scale. Whereas by using the technique of submerged propagation one can grow any variety of mushroom throughout the year, which does not require any hard labour. Mycelium can be used as a substitute for the mushroom. Regarding the flavour, it can be improved by using certain nucleotides and other flavour ingredients.

3. Objectives:

The objective is to standardise the method of production of edible mushroom mycelia by submerged liquid culture utilizing cheap organic materials.

4.1 Nature of Investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Raw material
utilisation

5. Period: April, 1975 - March, 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on extension of storage lives of fruits and vegetables and their processed products by combination treatments of low-dose gamma-irradiation, mild heat and dehydration.

2. Justification:

It is envisaged to reduce the losses of fruits and vegetables by combination treatments of low dosages of gamma rays, mild heat, dehydration and prepackaging to extend the storage lives without the losses of nutritive values, taste and odour and to prevent recontamination by these combination treatments.

3. Objectives:

- i) To increase the storage lives and reduce the losses in fresh fruits by low dose gamma irradiation.
- ii) To increase the shelf-life of canned mango and pineapple slices by combination treatments of heat and irradiation.
- iii) To increase the shelf-life of dehydrated vegetables in flexible packages by low dose irradiation.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Internal and Export trade

5. Period: April, 1975 - March, 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation, packaging and storage of pickles from some important vegetables.

2. Justification:

Traditionally several varieties of pickles are prepared with vegetables. It is evident from available information that at least 25-30% wastage occurs in vegetables before they are marketed and utilised. According to the latest figures available only 0.5% of these crops are processed. This shows there is lot of scope in economic utilisation of these raw materials. There are many enquiries from small scale industries and cooperatives for pickling and marketing of vegetables which are in a very good demand for internal and export market. If necessary scientific and technical know-how is supplied, the effective utilisation of these perishables, could be achieved.

3. Objectives:

Economic utilisation of perishables (such as vegetables) mostly at the centres of their production, to produce cheaper processed food adjuncts like pickles both for internal and external markets.

4.1 Nature of Investigation: Applied

4.2 Classification: Material R search,
Process Research,
Product Research &
Consultancy

4.3 Orientation: Wastage utilisation
& export promotion

5. Period: January, 1975 - Dec., 1978

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on control of spoilage, improvement of flesh colour and extension of storage life of mango fruit

2. Justification:

'Alphonso,' 'Pairi,' 'Baneshan' and 'Totapuri' mangoes are popular grafted varieties in South and Western parts of India. Total production of these varieties is estimated at 5,00,000 tonnes valued at Rs.430 million annually. Bulk of the produce (4,85,000) is consumed in the fresh fruit market for table purpose, about 13,000 tonnes are used in the factories for processed products and a small quantity (2,000 tonnes) is exported. Losses due to decay in the processing factories are about Rs.2 million annually since 20% of the fruits are discarded; and 30% of the produce are spoiled in the fresh trade market accounting for a loss of Rs.81 million annually. Besides, the flesh colour in Baneshan, Pairi and Totapuri are poor resulting in processed products of inferior quality and in turn affects the consumer appeal, export trade and nutritional status of the consumer in terms of Vitamin A availability.

3. Objectives:

To reduce the spoilage due to decay from 30% to 10% or below, extend the storage life at ambient temperature and improve the fruit flesh colour in terms of carotenoids.

4.1 Nature of Investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Export promotion
& conservation

5. Period: April, 1974 - March, 1976

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on soft centre in alphonso mangoes.

2. Justification:

Alphonso mango fruit develops a physiological ripening disorder after harvest termed as 'Soft centre,' 'Spongy tissue' or 'Internal breakdown.' Losses due to this ripening disorder are estimated at Rs. 1 million annually in the processing factory alone, since 30% of the 5,000 tonnes of fruits used in the industry develop soft centre and are not fit for slice packing but are used as fruit pulp and nectar of inferior quality. Losses due to this disorder in the fresh fruit market is very high since bulk of the produce (2,95,000 tonnes) is exported. Consumer preference for this cultivar will be reduced and export potential will be hampered if this disease is not controlled quickly and effectively.

3. Objective:

The results obtained during 1972-74 will be extended on a larger scale to control this post harvest ripening disorder in the entire south India or wherever Alphonso cultivar is grown in collaboration with IHR Bangalore, fruit processing factory and growers.

4.1 Nature of Investigation: Applied

4.2 Classification: Material research

4.3 Orientation: Export promotion & conservation

5. Period: April, 1974 - March, 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

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2. Justification:

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3. Objectives:

Promising treatments will be extended on a larger scale in the fruit processing factories and packing houses for internal trade and export.

Residual analysis of pesticide and its action on the quality and flavour of fruits in the fresh and processed form will be examined before recommendations are made for commercial use.

4.1 Nature of Investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Export promotion & conservation

5. Period: April, 1976 - March, 1979

Discipline: Fruit & Vegetable
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation of conditions for preparation of fruit bar from some important temperate fruits (Apricots, peaches, plums, apple).

2. Justification:

Production of temperate fruits in India is roughly estimated to be about 2,00,000 tonnes. Most of those fruits are consumed at present as fresh fruits and no fully organized efforts are made even marketing of fresh fruits. More than 25% of fruits is reported to be wasted annually. There is limited scope to make use of the surplus fruits in the growing centres for conversion into conventional products like juice, jam and canned product. Only about 0.5% of total production of these fruits is used at present for processing. There is therefore the necessity to create a new outlet for these fruits. A process of manufacture of fruit bar tropical fruits had already been developed and released to the industry. This process can be extended to temperate fruits to meet the varietal demands of the consumer for such product and better utilisation of the seasonal surplus.

3. Objectives:

- i) Development of new product from temperate fruits;
- ii) To provide a comparatively cheaper processed product;
- iii) To find new outlets for fruits which are available in large quantities during glut season and often go to waste.
- iv) To provide concentrated fruit products to the defence.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product Research.

4.3 Orientation: Wastage utilization

5. Period: April 1976 to March 1979.

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilisation of flexible packing materials
as alternative containers for fruits and
vegetables.

2. Justification:

The need for alternative containers as
substitutes to the conventional tin containers
has been felt due to shortage of tin. It is
expected that large quantities of diverse
types of flexible packing materials to suit
the special needs will be available by the
end of the IV Plan.

3. Objectives:

The objectives are to find suitable flexible
packing materials as substitutes to the more
expensive metal containers to be utilised
both for bulk storage and unit packs.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Import substitution

5. Period: June, 1975 to June, 1978

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of a continuous foam drying equipment.

2. Justification:

Retention of flavour, instant reconstitution and storage stability are the important characteristics of good quality fruit juice powders. Foam drying technique is the latest technique advocated for the production of such quality powders. It works at atmospheric pressure, avoids expensive vacuum system and does not require any sophisticated equipment. A batch type process has already been developed and some useful data have been collected which can form the basis for design and fabrication work. Initial investment cost is also low. The drier could be fabricated using indigenously available material. The food machinery manufacturing companies are not in a position to take up this work as they do not have necessary data at present. There is, therefore, the necessity to design and fabricate a foam extruder or applicator and a suitable continuous drier.

3. Objectives:

1. To design and fabricate a suitable foam drier.
2. To design and fabricate a proper foam applicator.
3. To test these equipment and study industrial feasibility of the process.
4. To develop suitable machinery and equipment for the industry for manufacture of fruit juice powders.

4.1 Nature of Investigation: Applied

4.2 Classification: Design & fabrication

4.3 Orientation: Import substitution and Developmental

5.0 Period: From April 1976 to April 1979.

Discipline: Flour Milling
and Baking
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

To develop bakery premixes for cakes,
doughnuts and bread

2. Justification:

In view of increased production of wheat in India (23 million tonnes in 1971), the question of utilisation of flour in diversified forms is of economic importance. The installed capacity of existing roller flour mills is about 5 million tonnes of wheat and bakery premixes can provide a market for expanded use of wheat in the country and can generate a new agro-industry.

3. Objectives:

To assist in the establishment of bakery premix industry after a study of the suitability of flours of indigenous wheats in standardized formulations.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Raw material utilisation

5.0 Period: From March, 1974
to March, 1977.

Discipline: Flour Milling and
Baking Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the malting qualities of
indigenous cereal grains

2. Justification:

There is a vast scope for developing agro-industries based on malting of indigenous cereal grains for malt extract and for use in malt foods and fermentation industry. Malting of wheat and barley offer scope because of indigenous availability. The triticales are also being introduced for cultivation and could be additional grain for study.

3. Objectives:

To obtain basic data on the malting characteristics of barley, wheat and triticales with a view to developing agro-industries for the effective utilisation of indigenous cereal resources for malt foods and fermentation industries such as distillaries, breweries and bread industry.

4.1 Nature of Investigation: Applied

4.2 Classification: Material and Product
research

4.3 Orientation: Raw material utilisation

5.0 Period: From March 1974 to
March, 1979.

Discipline: Flour Milling
and Baking
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effects on the milling and baking properties of wheat subjected to different disinfestation techniques, storage and protectants

2. Justification:

With the increased production of wheat (23 million tonnes in 1971) and anticipated further increase, the problem of storage under different treatments without detriment to the milling and baking properties and health of the consumer is of great economic importance in the context of the food problem of the country.

3. Objectives:

To devise optimum disinfestation techniques without affecting the milling and baking properties of wheat and its milled products.

- 4.1 Nature of investigation: Applied
- 4.2 Classification: Materials research
- 4.3 Orientation: Conservation
- 5.0 Period: From March, 1974
to March, 1979

Discipline: Flour Milling and
Baking Technology

SUMMARY OF PROJECT PROPOSAL

1. Project title:

Study of the milling, baking and associated characteristics of Indian wheats and of the environmental factors influencing these processing properties

2. Justification:

The introduction of new high yielding varieties of wheat for cultivation in the country has resulted in the availability of many wheats with unknown baking qualities. Considering the modern bread programmes and traditional baking these qualities have an economic impact on the producer, consumer and user industry. The present annual growth rate of bread industry is about 40% and of biscuit industry 15%.

3. Objectives:

To develop optimum milling and baking parameters for indigenous wheats and to eliminate dependence on import of wheats for the baking industry.

4.1 Nature of investigation: Applied

4.2 Classification: Materials research

4.3 Orientation: Raw material utilisation and import substitution.

5.0 Period: Continuation of the PL-480 Project from Fourth Plan upto 1974-75, likely to be extended upto 1975-77, and as Fifth Plan 1977-78.

Discipline: Flour Milling
and Baking
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Investigations on the use of substitute flours in the preparation of bakery products

2. Justification:

India has been importing large quantities of wheat aggregating over 55.7 million tonnes between 1951-1967. The bakery products are normally prepared from wheat flours of appropriate quality. The annual growth rate of bread industry is estimated at about 40% and of biscuit industry 15%. To extend the limited supplies of wheat available at reasonable cost, in addition to increased production, the use of supplementary sources of flour of roots, tubers, edible oilseed and coarse foodgrains (maize, sorghum and other millets) in bakery products can assure stability of price structure and self-reliance on indigenous resources.

3. Objectives:

To find out the characteristics and parameters for the use of supplementary flours in bakery products.

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| 4.1 | <u>Nature of Investigation:</u> | Applied |
| 4.2 | <u>Classification:</u> | Materials and product research |
| 4.3 | <u>Orientation:</u> | Import substitution |
| 5.0 | <u>Period:</u> | From March, 1974 to March, 1979.
(Likely to continue beyond fifth plan) |

Discipline: Industrial Research,
Consultancy &
Extension

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Standardisation of conditions for the
manufacture of chocolate products.

2. Justification:

Imports of cocoa beans and cocoa powder are declining. Efforts to grow cocoa in the country have been successful and are being encouraged. A number of products based on cocoa powder are in the market. The process is fairly well known, however, the conditions for the manufacture have to be standardised.

3. Objectives:

Collection of process details and the standardisation of conditions for manufacture.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Import substitution/
raw material utilisation

5.0 Period: April 1974 - April
1976

Discipline: Protein
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of protein foods for infants, children and other vulnerable groups.

2. Justification:

Work so far has shown that it is possible to evolve protein blends, having a high nutritive value and at the same time, economical in price, to produce weaning foods and milk-like beverages. The raw materials used are groundnut flour, legumes and cereals. As new sources of protein mustard cake, rape seed cake and sesame cake are being studied. The preparation of infant foods and milk-like beverage using these proteins, which may yield more nutritive formulations, should be possible.

3. Objectives:

To provide foods based on vegetable protein which can completely substitute milk in the nutrition of the population. The project will provide the necessary know-how for setting up plants for such products.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Raw material utilisation.

5.0 Period: From April 1974 to March 1979.

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of beverage type of foods (Carbonated beverages, coffee and tea whiteners, malted beverages) from vegetable proteins.

2. Justification:

Toned vegetable milk based on groundnut protein and milk has been developed. It is possible to have similar products based on other vegetable proteins, but without any milk protein. The nutritive value could be upgraded by selection of raw materials. At present considerable quantities of milk are being used in coffee and tea (about 30%) in many towns. This can be diverted for the nutrition of the vulnerable groups if alternate coffee and tea whiteners could be provided. Malted beverages based on vegetable sources could also be made to divert the milk now used for such products for the nutrition of children.

3. Objectives:

Investigations carried out hitherto have proved the justification of this approach. But the products developed have been limited to one raw material (groundnut flour). With newer sources of vegetable proteins like mustard oil cake, sun flower oil cake etc. it is possible to develop such foods without milk protein and these will be more economical.

4.1 Nature of Investigation: Applied

4.2 Classification: Material, process and product research

4.3 Orientation: Import substitution, export promotion and welfare.

5.0 Period: April 1974 to March 1977

Discipline: Protein
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of Infant foods based on newer sources of vegetable proteins

2. Justification:

Infant foods based on milk and on blends of vegetable protein and milk have been standardised. The latter is found to be as nutritive but more economical than the former. Infant foods based entirely on vegetable properties have yet to be standardised and this will be taken up under this project. The object will be to evolve highly nutritious infant foods within a price range more economical than the foods developed so far.

3. Objectives:

- a) To standardise and develop infant foods based on vegetable raw materials containing high lysine and methionine like edible mustard flour, sesame flour, sun flower flour and where possible containing single cell protein; checking economic and organoleptic feasibility.
- b) Evaluation of the foods by animal experiments followed by child feeding trials.
- c) Shelf life and packing studies
- d) Pilot and large scale production

4.1 Nature of Investigation: Applied

4.2 Classification: Process and product research

4.3 Orientation: Import substitution, export promotion, raw material utilization and welfare.

5.0 Period: April 1974 to March 1977

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of weaning foods based on newer sources of vegetable proteins

2. Justification:

Weaning foods have been developed based on groundnut flour, legumes and cereals. These have sufficiently high nutritive value but to some extent suffer from disadvantages like the presence of carbo-hydrates which may give difficulties in digestion or textural characteristics. To overcome these new techniques of processing like enzyme treatment and extrusion cooking have to be used. The investigations carried out now have shown the justification of this approach.

3. Objectives:

- (a) Newer protein sources like mustard, sun flower or safflower meals along with single cell proteins (where possible) will be used to evolve new blends. In processing enzymes (starch degrading, proteolytic and cellulolytic) will be used to modify the digestibility characteristics and textural characteristics.
- (b) Testing of the developed foods by animal experiments and child feeding trials. Shelf life and packaging studies.
- (c) Pilot plant and large scale trials.

4.1 Nature of Investigation: Applied

4.2 Classification: Material, product and process research

4.3 Orientation: Export promotion, raw material utilisation and welfare.

5.0 Period: April 1974 to March 1977

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of hydrolysed vegetable proteins for use as food adjuncts and flavour improvers

2. Justification:

Hydrolysed vegetable proteins have characteristic flavour and are being used in increasing amounts by the food processing industry. Soya sauce is commonly used as an adjunct in traditional oriental foods. Many new hydrolysed vegetable protein products have been developed in the USA and other countries in recent years. There is scope for developing such products from different raw materials.

3. Objectives:

- i) Use of different types proteolytic enzymes for the hydrolysis of vegetable proteins and standardizing the conditions of hydrolysis.
- ii) Study of the flavour characteristics of hydrolysed vegetable proteins and evaluating the potential use of such products.

4.1 Nature of Investigation: Applied

4.2 Classification: Process research/ Product research

4.3 Orientation: Conservation/Raw material utilisation

5.0 Period: April 1977 - March 1979

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of nutritious composite protein foods based on legumes and oilseed flours for use as ready-to-eat snacks or supplements.

2. Justification:

In the past, decade, considerable technological developments on the processing of oilseeds and legumes to obtain edible flours, protein concentrates and isolates have taken place. These products have been used to enrich processed foods, specially meant for infants and children. Since the average diet of the general population is also inadequate in many essential nutrients, there is considerable scope to evolve a class of enriched foods which could be marketed as ready-to-eat snacks and which will appeal to various age groups. Such foods can be based on mixtures of cereals, legumes and oilseed flours.

3.0 Objectives:

- (a) Formulation of the basic chemical composition of the snack foods.
- (b) Laboratory and bench scale development of the processes to obtain products of general acceptability.
- (c) Study of nutritional and organoleptic properties of the products.
- (d) Choice of packaging material and unit sizes for marketing and study of shelf-life.
- (e) Promotional programmes for marketing.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Welfare, raw material utilisation, industrial & economic development.

5.0 Period: From April 1974 to March 1979.

Discipline: Microbiology, Fer-
mentation Techno-
logy & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Protein food from cellulosic plant materials.

2. Justification:

The cellulosic plant materials are available abundantly (more than 18 million tonnes per year) in the country, the major one being paddy husk, which contains 40.5% of cellulose. Using such a raw material (bagasse), they have been able to produce microbial protein under pilot-plant scale at a cost of 6-7 cents (44-51 paise) per pound in U.S.A. In India, production of such proteins at low cost using cellulosic plant materials will no doubt help the country in solving the future increasing food shortages. This is proposed to be done first by the enzymatic hydrolysis of cellulosic material and then by growing protein organisms on the cellulosic digest.

3. Objectives:

- (a) Development of cellulases for the degradation of native celluloses
- (b) Production of microbial proteins using the cellulose digest
- (c) Nutritional studies of the proteins and
- (d) large-scale production of proteins from cellulosic digest

4.1 Nature of Investigation: Applied

4.2 Classification: Process & product research

4.3 Orientation: Wastage utilization (Agricultural)

5.0 Period: From April, 1975 to March, 1978.

Discipline: Microbiology, Fer-
mentation Techno-
logy & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on traditional alcoholic prepara-
tions like asavas and arishtas

2. Justification:

Asavas and arishtas and a number of traditional
alcoholic preparations are a rich heritage in
our country which may disappear fast if they
are not put on a scientific and a technological
base.

3. Objectives:

1. To elucidate the chemical, biochemical and
microbiological changes that occur during
preparation of traditional alcoholic prepa-
rations like asavas and aristas.
2. To modify the efficiency of existing methods
of preparation.
3. Development of new appetisers from the herbal
extracts with wine as base.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Development(industrial
and economic)

5.0 Period: From April, 1976 to
March, 1979

Discipline: Microbiology, Fer-
mentation Techno-
logy & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Microbiological standards for protein foods
and beverages based on oilseed proteins

2. Justification:

More and more protein foods and beverages based on oilseed proteins like Multipurpose food, Balahar, high-protein biscuits, fortified flours and bread, and Miltone are being introduced into Indian market. In order to develop high protein foods, peanut flour is being produced in the country to an extent of about 20,000 tonnes per annum. Similarly, the production of Miltone which is partly based on peanut protein isolate is fast expanding. In order to have a uniform quality of the products, microbiological standards play a very important role right from raw material upto finished product.

3. Objectives:

The primary objective is to study the microbiological quality of protein foods and beverages developed in CFTRI and also of those products which are already available in the market.

This study will also include on the spot study of some specific protein foods industries like Tata Oil Mills and Britannia Biscuit Co. Based on the data collected microbiological standards for protein foods based on oilseed proteins can be established.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials research

4.3 Orientation: Welfare

4.4 Collaboration: Protein Technology Discipline

5.0 Period: From April 1976 to March, 1979.

Discipline: Microbiology, Fer-
mentation Techno-
logy & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

The incidence and types of microflora of fish and fishery products

2. Justification:

India which is 7th among the major fish producing countries of the world (1,610,000 tonnes catch) has embarked on an ambitious programme for the development of fisheries export fetching valuable foreign exchange. The country is exporting fishery products to the tune of 31,575 tonnes (1970). Due to the highly perishable nature of fish, unhygienic methods of handling and processing, the exploitation of food from our ocean resources cannot be realised unless fish is handled and processed hygienically. Further, we have to meet the quality standards required by importing countries.

Thus, there is justification to investigate on the microflora of fish and fishery products and evolve suitable standards of quality. This will increase export of fishery products.

3.0 Objectives:

- (1) Enumeration of the incidence and types of microflora of marine and fresh water fish
- (2) Study of the extent and types of microbial spoilage of exportable fishery products (frozen, canned, dried prawns, dried, canned and frozen fish) and formulations of microbiological standards.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Export promotion

5.0 Period: From April 1975 to March 1979.

Discipline: Microbiology, Fer-
mentation Techno-
logy & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Production of enzymes by fermentation with special reference to enzymes used in food industries (Pentosanases, glucose-isomerase, thioglycosidase, phosphodiesterase, hesperidinase and naringinase).

2. Justification:

To develop technology for the manufacture of industrial enzymes and their utilisation in food industries.

3. Objectives:

Indigenous manufacture of industrial enzymes and their utilization in food processing. Export of these enzymes and processed foods.

4.1 Nature of Investigation: Applied

4.2 Classification: Materials and process research

4.3 Orientation: Import substitution and export promotion

5.0 Period: From April, 1974 to March, 1979.

Discipline: Meat, Fish & Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on utilization of shrimp waste and other wastes from curing yards and cannery

2. Justification:

At present frozen shrimp is exported to the tune of about 28 crores of rupees annually. Also during the recent years canning of shrimp in brine is gaining importance. During the processing of shrimp for freezing or canning purpose, about 40% of the original material forms head and peel portion. It is estimated that 2500 tonnes of dried material with 40% protein could be recovered from this waste. Apart from the waste from shrimp processing factories, there are considerable quantities of offal from fish curing yards and fish canning factories. The meal processed from shrimp/fish waste could be included in poultry ration to replace a portion of the cereals.

3. Objectives:

A conversion of fishery waste into a suitable meal for poultry feeding; improvement and standardization of the method. Development of processing units on cottage scale; costs and economics. During the last ten years, tremendous progress has been made in the poultry industry. Several hybrid birds have been introduced which have made the industry more commercial than before. Also at the same time, various schemes are in operation to produce a local hybrid by improving the 'desi' birds. As such, the population of birds is to multiply many times in the near future. In the development programme, feed will naturally received importance. This project is on development of processing units on cottage scale, costs and products evaluation.

4.1 Nature of Investigation: Applied

4.2 Classification: Product research

4.3 Orientation: Wastage utilization

5.0 Period: April, 1974 to
March, 1976

Discipline: Meat, Fish &
Poultry Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Transport of Chilled Mutton Carcasses

2. Justification:

The export of chilled and/or frozen sheep and lamb from India was 150 tonnes in 1961-62. This export has decreased very much and was 57 tonnes during 1969-70. The principal importing countries were Bahrain, Kuwait, etc. in the Persian gulf region. State Trading Corporation recently suggested that chilled mutton carcasses fetch a premium price in Kuwait as compared to frozen mutton, but has to reach them within 24 hours of slaughter and chilling.

3. Objectives:

To devise a suitable package for whole chilled mutton carcasses where in-transit refrigeration is provided by dry ice and/or frozen water or pre-cooled jelly. Wholesale price of sheep carcass in North India is Rs.4-50/kg. The price of good mutton in Kuwait is Rs.14-15/kg.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research and Design

4.3 Orientation: Export Promotion

5.0 Period: April, 1975 to March, 1977.

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Processing of trash fish into high protein food in the soluble form or in the form of emulsion simulating milk

2. Justification:

A fair percentage of the fish catch is small sized fish such as white sardines, silver bellies, penaeid shrimp, etc., which at present are not being properly utilised. It is estimated that about 70% of the trawler catch constitutes trash fish and only the balance of 30% is made up of shrimp and other quality of fish. It is estimated that about 70,000 tonnes of trash fish are being landed. The most profitable utilisation of trash fish is, therefore, a very vital problem. The quantity of trash fish landed may go up enormously before the end of the next Fourth Plan where another 5,000 small mechanised boats are likely to be commissioned. These surplus fish if utilised as high protein food in the form of soluble or emulsion simulating milk will go a long way in relieving protein malnutrition and at the same time bring economic benefits.

3. Objectives:

A large part of India's population suffers from malnutrition. To raise the nutritional standard of people, we should increase the protein intake by about 25 gm daily. In other words, to accomplish this task, we require 4 million tons of processed protein annually. At present greater part of the nine million tons of oilseed products in India is now exported so that oilseed cakes are used for cattle feed in developed countries. As such, the oilseeds will hardly meet even the quarter of the requirement for this purpose. In this respect, trash fish is ideally suited to meet our requirements. Processed fish products as envisaged above will supplement the diets with lysine, methionine and other essential amino acids.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Raw material utilisation

5. Period: December, 1974 to December, 1977.

Discipline: Meat, Fish &
Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of improved containers,
mode of transport and distribution of
fresh water fish on commercial scale.

2. Justification:

The performance of the present containers used in India (baskets and second hand tea chests) is poor with respect to (i) insulation to maintain the temperature of the iced fish at the desired minimum; (ii) mechanical strength to prevent injury and pilferage; and (iv) hygiene. Only about 10% of the 50,000 tonnes annually transported by rail are carried in refrigerated wagons and the rest are transported by ordinary parcel wagons. The period of transport ranges from 24 to 96 hours, and most of the ice melts during transit. As a result, only a low percentage of fish (about 10%) reach the destination at a desired low temperature (1-5°C). Because of rough handling, poor hygiene and high temperature, 25-50% of fish become sub-standard, causing enormous loss to the industry. It is estimated that in Calcutta alone, the daily loss is around Rs. 25,000/-. The studies are confined to fresh water fish because 80% of fish transported by rail belong to these species. Further increase is anticipated due to the following reasons: (i) there has been nearly 50% increase in production from 1958 (309,000 tonnes) to 1968 (450,000 tonnes) showing increasing trend of production; (ii) only 0.61 m. hectares out of 1.65 m. hectares of available culturable water area is utilised at present. There is scientific evidence that fresh water species are biochemically unique and associated bacterial flora different from marine species, justifying special considerations.

3. Objectives:

- (i) to develop better containers taking into account local needs and resources, cost, mode and duration of transport

- to ensure minimum loss of quality and maximum return to the industry.
- (ii) to evolve a container system for bulk transport by railways,
 - (iii) quality and temperature evaluation during transport under commercial scale.
 - (iv) to compare and evaluate alternate refrigeration media
 - (v) packaging and transportation of filleted fish
 - (vi) to evolve a code for handling fresh fish.

4.1. Nature of investigation: Applied

4.2. Classification: Process Research/
Design and Fabrication

4.3. Orientation: Conservation

5. Period: From April 1975 to
March 1979.

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the qualitative and quantitative characteristics of meat quality in Turkeys

2. Justification:

Turkey meat for consumer market has become a multimillion dollar industry in advanced countries. Variety of Turkey dishes are now served on family dinner tables; in hotels and restaurants. Uniform quality fine grained tender or plump good flavoured Turkey meat is good source of protein with assortments of minerals and vitamins.

In Mysore State in the Kolar District, some people are raising Turkeys for meat purpose but this has not been done in an organised way. It appears that the climatic conditions of Mysore is favourable for raising Turkeys. Turkeys are good converter of feed into meat and reach heavy weight in short time. There is a good demand for Turkey meat during special occasions and it is also available in limited quantity round the year although the cost is higher. Turkeys have good market in India. Organised Turkey production and processing work has so far not been done in India and its meat quality has not been studied.

3. Objectives: Assessment of objective and subjective method of meat quality in relation to breed, feeding and management practices and age. To study the economics of Turkey meat production and consumer preference, practice and demand for Turkey meat.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Conservation

5. Period: April 1975 to March 1979.

Discipline: Meat, Fish & Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quantitative evaluation of meat in
comminuted meat products.

2. Justification:

The target of meat products is 10,000 tonnes per year by the end of the IV Plan. Of this about 20% consists of sausage type products. Since grinding to different extents is involved in the making of these products the physical structure of meat is completely broken down during production. For this reason, comminuted products are liable to adulteration with non-meat diluents and also edible offal. M.I.D. of USDA aims at preventing this by specifying that the moisture content in sausages should not be more than $4P + 10$ where P is the protein level in the cooked finished product. They also station an Inspector in all meat processing plants. ISI also specifies that the total ingredients from meat should not be less than 80% and that soya protein shall not be used. But the method suggested by ISI to estimate lean meat content distinguish between nitrogen from meat and that from non-meat sources. Thus there is a need to develop quantitative procedures to evaluate the meat used in various products.

3. Objectives:

To collect data on various characteristics components of meat to develop a procedure for quantitating the proportion of meat proteins and also the species of meat in a given meat product.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Regulatory
purposes

5. Period: April 1976 to
March 1979

Discipline: Meat, Fish & Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Utilisation of culled and aged birds for processing of chicken noodles.

2. Justification:

With the growth of broiler houses and farms, vast number of birds will be available. It is estimated that at present about 120 million poultry is available. With the improvement in bird rearing and introduction of high yielder new strains production of birds is to multiply many times. A fair percentage of these culled birds or birds that are tough in meat. A stage is reached when these birds are no more productive and on the contrary they become a liability. It is, therefore, necessary to find efficient use for these birds. If these are put to profitable use, the economic returns are obvious.

3. Objectives:

To utilise the meat of these birds for production of chicken noodles which is a delicacy. The product is very popular for its delicious taste but it is at present imported.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Import substitution :
utilisation of birds that
are unproductive.

5. Period: April 1977 to March 1979.

Discipline: Meat, Fish &
Poultry Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Efficient utilisation of blood from slaughter houses.

2. Justification:

With the growth of meat packaging plants, vast quantities of blood will be available. According to latest livestock census, there are in India 175 million of cattle, 51 million buffaloes, 60.9 million of goats, 40.2 million sheep, about 10 million pigs and 114.3 million poultry. It is estimated that there are more than 2,800 slaughter houses of various sizes in the country where more than 46 lakh animals are slaughtered. Blood available daily is not profitably utilised. At present it is converted into a poor quality meal with deep black colour. It, therefore, calls for efficient utilisation of this nutritious material.

3. Objectives:

To separate serum from the RBC and utilise serum for high protein foods by concentration. The RBC could be bleached and converted into a high class feed. Also it could be digested to prepare extracts in assimilable form. Serum concentration could be put to a number of therapeutic purposes. The serum could also be used as a binder in a number of food preparations.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Utilisation of waste product.

5. Period: April 1975 to March 1977.

Discipline: Meat, Fish & Poultry
Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Hastening the process of digestion of fish for the production of a high quality fish sauce.

2. Justification:

It is estimated that about 70% of the trawler catch constitutes trash fish. As such, about 70,000 tonnes of trash fish are being landed. These fish are cheap and do not find proper use. These fish could be profitably utilised for the production of fish sauces which are very popular and in great demand in South East Asian countries. As such, there is a possibility of exporting this to these countries because there the demand is more than the production. Also these fermented products are finding favour in Indian dishes. There is thus likely to be a scope for these products in the internal market.

3. Objectives:

To improve upon the existing technology of fish sauces, to hasten the process for digestion by incorporating active proteolytic enzymes and maintain optimum condition for the breakdown of protein by controlling pH, temperature, size of the fish, concentration, etc. At present the fish are subjected to digestion for a period of 1 to 1½ years.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Export Orientation

5. Period: April 1977 to March 1979.

Discipline: Meat, Fish &
Poultry Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Production of Sausage casings -
salted and semi-dry.

2. Justification:

Improvement of the quality of the salted casings exported is imperative not only to maintain the present level of export but also to improve it. The main drawbacks of casings exported from India are (i) incomplete sliming; (ii) dull colour; (iii) inadequate salting; (iv) improper sanitation mainly insufficient water and (v) nonuniformity of calibration. The casings imported by Japan from other countries are cleaner, of better standard and stronger.

The aim of this proposal is to maintain the quality standards as desired by the importing countries, by utilising the processing aids and stripping and sliming rollers as worked out in the earlier project.

3. Objectives:

To improve and standardise the stripping and sliming rollers.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research, Design and fabrication

4.3 Orientation: Export promotion, quality improvement, By-product utilisation

5. Period: April 1977 to March 1979.

Discipline: Meat, Fish & Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the quality of duck eggs marketed in different parts of the country.

2. Justification:

Raising of ducks is slowly gaining momentum in eastern and southern sectors of the country. The reasons behind this are housing and cheaper management of ducks. They lay 30 to 40 eggs more than a hen per year and duck eggs weigh 14 to 21 gm more in comparison to hen eggs. As regards nutritive quality there is not much difference between duck and hen eggs. The only drawback that comes in the way of marketing duck eggs are their susceptibility to quick spoilage during storage. The reasons which could be attributed to this might be the peculiar laying habit of eggs by the ducks.

The total duck population as per 1961 census in the country is 66,97,252 (9% of the total poultry population) which lay around 401.4 million eggs (16% of the total egg production). However, there is no exact estimate as to show how many of these eggs are spoiled in the process of marketing and how many are available in good condition to the consumers. According to Bose (1965) one out of every four eggs produced in the country do not reach the hands of the consumer in safe condition. If this is true, then the total losses of duck eggs, in terms of inferior quality and spoilage might come around 100 million eggs. This in terms of money might come around Rs. 25 million. Hence it is worthwhile to study the internal, physical and microbial quality of such eggs in the marketing channel and how best they can be preserved in good condition for distribution to the consumers.

3. Objectives:

- i) Catering of clean and wholesome duck eggs to the consumers and development of a method for curtailing microbial agents present on the egg shell surface.
- ii) Suggestion of methods for maintaining internal physical qualities of duck eggs intended for human consumption during the process of storage and marketing.

4.1 Nature of investigation: Applied research

4.2 Classification: Product Research

4.3 Orientation: Conservation

Period: April 1976 to March 1979.

Animal House

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on utilisation of waste products of poultry industry - spoiled and incubator reject eggs and viscera from dressed poultry.

2. Justification:

According to information available, at present the value of losses due to spoiled eggs and viscera of dressed poultry might touch a few crores of rupees per annum. A profitable utilisation of these items might help to a great extent in providing more income for the poultry industries and at the same time saving some animal protein foods for the livestock industry. However, before taking up such a problem one should know precisely what is the amount of waste available in different parts of the country from various industries and whether it is technically possible to utilise them economically. Some useful and economical processes for utilising these products as animal feed and tanner's yolk need to be explored.

3. Objectives:

- i) Development of suitable methods for utilising the waste materials of poultry industry
- ii) To increase the availability of protein foods for livestock industry
- iii) To minimise losses incurred in the country.

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Wastage utilisation

5. Period: April 1974 to March 1977.

Discipline: Process Development
and Design.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Improvements in natural and artificial methods of drying freshly harvested food commodities.

2. Justification:

A number of food commodities of the type of oilseeds like groundnuts and spices like cardamom, ginger, turmeric, etc., have to be dried after harvest prior to marketing and storage. The grower now depends almost exclusively on the sun to dry his produce. The natural methods of drying as practised at present are largely primitive and offer much scope for improvement and the resultant up-grading of quality should go a long way in increasing the income to the grower. Often, the weather conditions are adverse for sun-drying at the time of harvest with the result that there is considerable impairment of the quality of the product available for marketing. In such cases, there is an imperative need for some sufficiently cheap method of artificial drying either at the ambient or higher temperature.

3. Objectives:

To improve methods of natural drying of agricultural commodities following harvest and devise cheap methods of artificial drying for use under adverse weather conditions with a view to help establish farm drying practices on a sound basis calculated to ensure not only an economic return to the grower but also availability of high quality material for internal consumption as well as export.

4.1 Nature of investigation: Applied /

4.2 Classification: Process Research, Design and Fabrication

4.3 Orientation: Conservation

5. Period: April 1977 to March 1979.

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Assessment of packaging materials and containers for their suitability in the packaging of foodstuffs.

2. Justification:

With the increase in the production of packaging materials as well as the rapid growth of industries in the small scale sector, this laboratory will have to bear an ever increasing burden of aiding the industry in assisting them to solve their packaging problems. Even now, many industries are utilising the facilities in this laboratory.

In addition to growth in the production of traditional packaging materials, advent of new plastics and their laminates and the change in the concepts of packaging, makes the role of the laboratory in assessing the suitability of the latter in the packaging of foodstuffs all the more important. With the absence of sufficient knowledge on the physical and chemical characteristics of the packaging materials, they are being used indiscriminately leading to the wastage of packaging materials due to overpackaging on one hand and detriment to the contents on the other. Even now there are many requests from the industry to assess the suitability of newer plastics like PVC in packaging of foodstuffs particularly for the permissible limits of extractables on which there is no uniform agreement in the International scene.

The work envisaged in the project will be useful to the industry in the following aspects: (i) quality control of packaging materials; (ii) design of new packages; (iii) evaluation of packages for industry and new uses to packaging materials.

Needless to emphasise, the changing of concepts in packaging are the outcome of need to have better functional performance and in working out new substitutes to relieve heavy demand for materials like glass, tin.

3. Objectives:

To assist the industries by extending the testing facilities. To study the suitability of various packaging materials for different types of foods by the analysis of the processes of interaction between the materials and the foodstuffs contained in them. To improve the existing test methods and to develop new methods for the better evaluation of packaging materials and packages.

4.1 Nature of investigation: Applied

4.2 Classification: Materials Research

4.3 Orientation: Materials utilisation and
Industrial Testing

5. Period: April 1974 to March 1979.

Discipline: Process Development
& Design

1. Project Title:

Heat sterilisation of foodstuffs in flexible packages.

2. Justification:

Many meat, vegetable and fruit products are heat sterilised in tin cans. About 5,500 tonnes of tin plate was used in 1968-69 and 8,500 tonnes is the estimated requirement in 1973-74 for this purpose. Milk or milk based foods are generally sterilised in glass bottles. Tin being an imported and scarce metal, its substitution is important for food industry. One of the important methods of substitution is to use flexible packages instead of tin cans. It is envisaged that during the V Five Year Plan, suitable laminates and plastic films like polyester films, polyamide, etc., will be produced in the country. Aluminium foil that is necessary for laminates suitable for heat sterilisable flexible pouches is already produced in the country. If tin can be replaced at least partially it saves foreign exchange. The flexible pouches being flat requires less process time (but with proper equipment) and can give a better quality product. Due to the ease with which a flexible pouch can be carried in a pocket, it has great potential advantage in defence logistics. When flexible pouches replace milk bottles for sterilisation it not only relieves lot of pressure on glass bottles, but also reduce the freight cost considerably.

3. Objectives:

To select suitable flexible packages and to develop processing schedules for heat sterilisation of wet foods like minced meat, peas and cooked cereals.

4.1 Nature of investigation: Applied

4.2 Classification: Product Development

4.3 Orientation: Import substitution

5. Period: April 1975 to March 1978.

Discipline: Process Development
& Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Packaging of dressed poultry and pork.

2. Justification:

About 90 million broilers are bred in the country. Out of this, 75% are dressed per year. A large number of poultry farms have come into being and during the next plan more and bigger farms are likely to come into operation. These birds are now sold fresh in unpackaged condition in the local urban markets. They are rarely transported to distant markets due to lack of cool transport system. It is envisaged by 1975 when the production of the dressed birds increases, cool transport carriers of both rail and road transportation will be available for the purpose. For keeping the hygiene and to reduce the drying from the dressed poultry, individual birds need to be bagged or wrapped in flexible films or laminates. Wherever the cool transport is not available, pre-chilled birds have to be transported in insulated transport containers. A similar need for the packaging of pork arises when the present production of pork (in the eight regional piggeries) increases in the V Five Year Plan.

Later when the frozen storage is available, these individual birds or meat chunks are to be packaged to reduce the freezer burn. It is expected during the V Plan period that shrinkable films like saran or at least oriented polyethylene or polypropylene will be available for the purpose. Working out the packaging fashion for the dressed poultry and pork will be an important step in the development of these industries.

3. Objectives:

To evolve efficient unit packaging and transport package for dressed poultry and fresh pork.

- 4.1 Nature of investigation: Applied
4.2 Classification: Materials Research
4.3 Orientation: Conservation
5. Period: April 1975 to March 1979.

Discipline: Process Development
& Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Packaging of fruits and vegetables.

2. Justification:

It is estimated that more than a quarter of the 20 million tonnes of fruits and vegetables produced in the country are lost during transportation, storage and distribution. Out of this loss which is valued at Rs. 2,400 million annually, at least a half can be saved by proper packaging, handling, transportation and storage. In all these stages, packaging plays the most important role as efficient handling, transportation and storage also depends on packaging to a large extent.

Being living entities, fruits and vegetables are highly susceptible to their external environment and to the physical stresses during handling, storage and transportation and deteriorate very fast. The causes of deterioration are very many like the composition of its external atmosphere, temperature, moisture and physical stress. Even attempts to reduce the intensity of one of the causes leads to the increase in the intensity of another inside the package and this poses problems in controlling the deterioration by packaging. In order to reduce the deterioration to a minimum, a balance is to be struck between the various causes of deterioration. This requires an understanding of the process of deterioration due to various causes like oxygen, temperature, moisture, microbes and physical stress and relationship of their intensity to the deterioration. From this knowledge, it should be possible to arrive at optimum conditions for minimum spoilage.

3. Objectives:

To study the relationship of the deteriorative changes and aging characteristics to the external causes like composition of the

atmosphere, temperature and humidity and physical stresses like compression, impact and vibration and to use this relationship for evolving design criteria for packaging of important fruits and vegetables and to suggest methods for their handling, loading, storage and transportation.

- 4.1 Nature of investigation: Applied
- 4.2 Classification: Product Research
- 4.3 Orientation: Conservation and waste reduction
- 5. Period: April 1974 to March 1979.

Discipline: Process Development
& Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on continuous extraction of food products with special reference to spices and development of a continuous extractor for extraction of spices, tea and coffee.

2. Justification:

Extraction of soluble constituents, flavour and pungent principles is a common unit operation in many food processing industries. The annual export of spices from India exceeds Rs. 20 crores including pepper, ginger, turmeric, cardamom, cumin, etc. Pepper alone is exported to the tune of 20,000 tonnes per annum.

The raw spices are bulky requiring huge shipping area and losses due to microbial spoilage on transport due to climatic conditions. These can be avoided by exporting concentrated spices extracts known as oleoresins. Know-how for the production of oleoresin from pepper has been developed by CFTRI. The process has been released to 6 firms with a capital outlay of Rs. 4 - 5 lakhs, each.

Batch type percolators are currently employed, especially in coffee industry and for oleoresin extraction from spices. These involve too much handling and loss of solvent to an extent of 5-6 per cent. A continuous extractor will lead to less labour costs, shorter operating cycles, lower investment cost and cost of production. Oleoresin has a big export potential and growing market both in this country and abroad.

3. Objectives:

Design and fabrication of a continuous extractor handling 10 kg. pepper powder per hour. Extraction studies for collection of performance and scale up data. Designing a 100 kg. per hr. plant and study of economics of continuous oleoresin plants.

4.1. Nature of investigation: Applied

4.2. Classification: Process Research

4.3. Orientation: Export Promotion

5. Period: April 1974 to October 1976.

Discipline: Process Development
& Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of a Through-Flow Drier of 50 ft² of tray area for drying vegetable and harvested commodities.

2. Justification:

Requests for this being received from industries for complete design drawings to fabricate driers for drying desiccated coconut, garlic, cardamom, coffee, copra and other commodities, of capacity ranging from a few hundred kilograms to several tonnes. At present, all the dehydration plants are imported at a cost of Rs. 3 lakhs each for a plant of 3 tonnes per day.

The main drawback of presently available driers is the non-uniform air distribution in the drying chamber resulting in over-drying and scorching of the product.

3. Objectives:

As this drier can be worked to simulate the conditions prevailing in a commercial unit, the data that can be obtained will be very useful and related for sizing bigger units. The experience gained on this drier will supplement the know-how regarding the design of dehydration equipment.

4.1 Nature of investigation: Applied

4.2 Classification: Design and Fabrication

4.3 Orientation: Raw material utilisation

5. Period: June 1974 to March 1976.

Discipline: Process Development
& Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process Development Studies on Accelerated Freeze Drying of Foods - Design and Fabrication of a 30 sq.ft. Radiant Type Accelerated Freeze Drier.

2. Justification:

65% of all foods exported from India is of the frozen sea foods and marine products account for 80% of the total value of export. Frozen shrimp accounts for 75% of the country's export earning and the product is marketed in over 35 countries.

The market for frozen shrimps is highly fluctuating and the freeze drying industry is faced with many obstacles. The exorbitant freight rates and lack of shipping facilities handicap the export of frozen shrimp.

Freeze dried shrimps are quality products and the economics of shipping freeze dried shrimps are obvious for reasons that it does not need refrigerated storage or transport. The capital requirement for a complete plant imported from abroad would be Rs. 10 lakhs.

We have received requests from M/s. Vulcan Lavals for collaboration in development of a 30 sq.ft. Unit.

3. Objectives:

Fabrication of an accelerated freeze drier of 30 sq.ft. area complete with condenser, vacuum pump, instruments and control; collecting performance and scale up data.

4.1 Nature of investigation: Applied

4.2 Classification: Design and Fabrication

4.3 Orientation: Export promotion and raw material utilisation

5. Period: April 1975 to December 1976

SUMMARY OF PROJECT PROPOSAL1. Project Title:

Design and fabrication of a continuous experimental through-flow drier for vegetables and extruded products.

2. Justification:

With the increase in the production of harvested commodities and requirements of Defence rations like dehydrated potato dices, onions, etc., continuous dehydration will have to develop at an early date. Already, there are some imported continuous dehydrators for vegetables in the country. We have been receiving enquiries from manufacturers asking for complete fabrication details for continuous dehydration equipment. It is proposed to fabricate an experimental continuous through-flow drier having a capacity of 25-40 kg. of raw charge per hour. Studies on this unit will provide guidelines for scaling up bigger equipment.

3. Objectives:

It is proposed to design and fabricate a continuous band type drier capable of handling 25-40 kg. of prepared wet charge per hour for products like potato, onion, carrots, desiccated coconut, etc. Experience gained and data obtained on the unit will be of much use in scaling up commercial units for which enquiries are being received.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Raw material utilization and import substitution

5. Period: June 1977 to December 1978

Discipline: Process Development & Design.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of Grinding Methods for spices.

2. Justification:

There is a slight decline in the export of Indian spices due to high cost of transportation and lack of new types of products. One of the best methods of cost reduction in transportation is by reducing bulk by grinding the spices. Further, it leads to development of new products. An exhaustive study of grinding, the physico-chemical changes involved, suitability of various grinders to various spices, is necessary. This makes possible the development of new, ground spice products and a boost in our spices export.

3. Objectives:

To acquire extensive knowledge about grinding methods, suitability of grinders for certain spices, the heat development, its effects on properties of spices, preconditioning of spices before grinding, etc. To develop new, ground spice products and for export purposes.

4.1 Nature of Investigation:

Applied

4.2 Classification:

Process research,
design and
fabrication

4.3 Orientation:

Export promotion.

5. Period:

April 1976 to March 1978.

Discipline: Process Development
and Design.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development, Design and Fabrication of a
Pineapple Coring and Sizing Machine.

2. Justification:

Though there is a potential market for canned pineapple slices both in India and abroad, lack of proper equipment has hampered processing of more pineapples. A good sizing and coring machine is required to produce good quality pineapple slices. The market in West Germany, Switzerland and Italy could not be exploited because of high cost of processing owing to manual operations. A good coring and sizing machine will lessen the processing cost considerably besides improving the quality of slices.

3. Objectives:

To design a machine for sizing and coring pineapple fruits, fabricate a prototype and introduce the same in pineapple consuming industries.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and Fabrication

4.3 Orientation: Export promotion, import substitution and quality improvement.

5. Period: July 1976 to June 1978.

Discipline: Process Development
and Design.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Continuous Washing and Waxing Machine
for Fruits and Vegetables.

2. Justification:

In India about 7,80,000 tonnes of oranges (1965), 4,50,000 tonnes of lemon (1965), 12 million tonnes of potatoes (1971) and 5,00,000 tonnes of tomatoes are produced annually. About 500 tonnes of potatoes are exported. About 4 to 5 million cans of peeled potatoes are supplied to the Defence. It is envisaged that the production of all these products go up very high with the growth of 'Green Revolution'.

So, in view of the increased potential of production, it is essential to mechanise the processing operations of fruit and vegetable industry. These units are imported from Eastern Europe as part of complete tomato or mango processing plants. Hence, this unit will, to a large extent, contribute to the industry.

This unit is meant for washing round fruits and vegetables, viz., apples, oranges, lemons, potatoes and tomatoes and waxing the fruits after washing to increase shelf-life especially when they are exported.

3. Objectives:

Designing and fabrication of the prototype unit for satisfactory working; to mechanise the fruit and vegetable processing industry and also import substitution and export promotion.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and Fabrication

4.3 Orientation: Import substitution.

5. Period: April 1977 to March 1979.

SUMMARY OF PROJECT PROPOSAL1. Project Title:

Design and fabrication of bread wrapping machine.

2. Justification:

The non-development of indigenous packaging machinery today is a retarding factor in the country's progress. In order to meet the increased demand of the packages, the manufacture of packaging machinery of greater efficiency is essential. The present machinery manufacturers do not have sufficient know-how to take up the indigenous production of packaging machinery of their own. Most of the food packaging machinery available in the country are imported. The development of high-speed food packaging machinery in our country will vastly improve the packaging efficiency.

3. Objectives:

To design and fabricate one bread wrapping machine capable of wrapping about 15000 loaves per hour.

4.1 Nature of Investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Development and import substitution.

5. Period: January 1978 to December 1980.

Discipline: Process Development
and Design

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design and fabrication of sterilized and/or pasteurised milk packing equipment.

2. Justification:

The Government is considering large scale distribution of milk to the educational institutions, orphanages etc. The packaging of milk in plastic pouches is more economical than packaging in glass containers which involves cleaning, filling, capping, transportation of empty bottles etc. Also broken bottles to be replaced by new ones. The availability of milk packaging equipment will vastly help in quick and efficient distribution of milk not only to schools and orphanages but also to consumers.

3. Objectives:

To design and fabricate one milk packaging equipment capable of producing about 1800 milk pouches per hour.

4.1 Nature of investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Development (Industrial and economic) and import substitution.

5. Period: January 1975 to
December 1977.

SUMMARY OF PROJECT PROPOSAL1. Project Title:

Development of shipping containers for commercially imported fruits and vegetables.

2. Justification:

The current annual production of fruits and vegetables is estimated to be 20 million tonnes valued Rs. 1200 crores. By the end of the 5th Five Year Plan, this is expected to rise to 30 million tonnes.

Currently the post-harvest losses in fruits and vegetables is estimated to be 15-20% (i.e., 3-4 million tonnes), of the total produce, valued Rs. 180-240 crores. Considering the status of packaging and handling in the country, it is quite probable that these losses may be still higher, as most of the post harvest losses can be attributed to improper packaging, loading and handling methods. By improving or changing the packaging, loading and handling methods it may be possible to bring down these post harvest losses by a quarter of their present level. This means a savings of about 40-60 crores of rupees per annum.

It is also to be noted that any reduction in spoilage of wastage can be viewed as equivalent to growing more.

3. Objectives:

Designing shipping containers capable of withstanding transport hazards and suitable for climatic conditions in India, and to evolve suitable loading and handling practices, to help reduce the spoilage of fruits and vegetables during transit.

4.1 Nature of Investigation: Applied

4.2 Classification: Design

4.3 Orientation: Conservation

5. Period: April 1974 to March 1979

Discipline: Experiment Station
Headquarters.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on Deep Fat Frying of traditional Indian Foods.

2. Justification:

The total production of vegetable oil in the country in 1970 stood at 2.4 million metric tonnes, against the actual requirement of 7.7 million metric tonnes. The deficit was partially made up by imports to the tune of 72,726 metric tonnes.

Of the various ways in which vegetable oils are used in food, deep fat frying of foods, perhaps is most important requiring large quantity of oil for the process and imparting as much as 25-30 per cent fat to the product itself.

In view of the high cost and shortage of vegetable fats, there is need to work out processes to (a) reduce fat content of the fried product without losing any of the characteristics of the fried product; (b) enable optimal utilization and/or render the presently discarded frying fat re-usable.

3. Objectives:

1. Conservation of fat in deep fat frying of food and/or to find a substitute method.
2. Design and fabrication of equipment for deep fat frying.
3. Translation of the results of work into practical use through extension service.

4.1 Nature of Investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Raw material conservation and waste utilization.

5. Period: April 1975 to March 1979.

Discipline: Experiment Station,
Hyderabad

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on some typical conventional pickles and chutneys of Andhra Pradesh.

2. Justification:

Pickles and Chutneys are established products of India. The industry employs traditional methods on home scale or cottage industry scale for the manufacture of pickles and chutneys. In addition, keeping quality of these products are rather poor.

3. Objectives:

1. Survey of pickle industry of the region.
2. To standardise common recipes of pickles and chutneys of the region and to work out processing schedules for the manufacture of pickles and chutneys with enhanced storage life.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process and Product Research.

4.3 Orientation: Conservation

5. Period: April 1975 to March 1979.

Discipline: Experiment Station,
Nagpur.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation of terpeneless orange flavour
from Nagpur Mandarin orange oil.

2. Justification:

The culls constitute about 6000 tonnes (5%) out of a total annual production of 0.12 million tonnes in the Vidarbha Region. This can yield about 1200 tonnes of peels (20-25%) which will give about 12 tonnes of orange oil (1%) valued at about Rs. 5 lakhs. From the orange oil the yield of terpeneless oil is about 2%. The quantity of terpeneless oil obtained could be about 250 kgs.

The real flavouring components of orange oil are the oxygenated compounds. The use of orange oil for flavouring in various orange products limits its storage life by imparting terpenous flavour due to its oxidation. At present terpeneless oils are mostly imported under export promotion incentives for use in fruit products. There is a demand of terpeneless oil in the carbonated beverage industry which is rapidly increasing. The preparation of terpeneless oil will thus be of import substitution value.

3. Objectives:

1. To meet the demand of the Fruit Processing Carbonated Beverage Industry in the country and this will facilitate import substitution.
2. To develop essential oil units for by-products utilization of the orange processing industry with an export angle.

4.1 Nature of Investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Import Substitution

5. Period: April 1976 to
March 1979.

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the raw materials required
for fish sausage industry

2. Justification:

Fish sausages are ready to eat products which are popular in Japan and in some of Western countries. In India they are prepared in Marine Products Processing Training Centre, Mangalore, as a part of training. It was found to have good demand from public. A cheap nutritious ready-to-eat product, it will have good market. Most of the trash fish, constituting 20% marine landing (240,000 tonnes) which are mostly ~~waste~~ may be used for wasted preparing such product.

3. Objectives:

- i) This study will help the utilisation of some of the trash fish
- ii) This study will help providing raw materials required by the industry to produce standard products.

4.1 Nature of investigation: Applied

4.2 Classification: Material Research

4.3 Orientation: Raw material
utilisation

5. Period: September 1976 to March 1979.

Discipline: Experiment
Station,
Headquarters

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on Indian traditional foods
based on wheat

2. Justification:

Nearly 18 million tonnes (75%) of the total wheat production is consumed in Indian households, hotels and canteens in the form of various traditional foods. Lack of systematic data in respect of the quality parameters and keeping quality of the foods as influenced by storage, additives, etc., calls for a scientific study of the various aspects - more so in light of increasing number of canteens for industries, administrative offices and educational institutions.

3. Objectives:

- i) To fix quality parameters for foods
- ii) To study the suitability of Indian wheats and their blends for the preparation
- iii) Preparation of precooked dehydrated sweet and savoury snacks

4.1 Nature of investigation: Applied

4.2 Classification: Material, Product and Process Research, Consultancy and Extension

4.3 Orientation: April 1974 to March 1979.

Discipline: Experiment Station,
Headquarters

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Design, fabrication and testing processing equipment (i) continuous press
(ii) meat picker

2. Justification:

Fish processing industries in India are mostly dependent on imported machinery. It is desirable to make attempts at indigenous fabrication of the equipment required. This project envisages design and fabrication of two important units:

Dewaterer: Removal of water and also sometimes oil is a primary process in production of fish meal and oil. In traditional fish meal manufacture in India, replacing the present manually operated batch type presses with electrically operated continuous screw press would considerably improve the output and quality of the product. Such a dewaterer would also be useful in preparing fish mince for human consumption.

Meat picker: A machine for separating edible fish from bones and skin from cooked or raw fish would be helpful in preparation of sausage or paste type products and also dehydrated fish mince or powder free from grittiness. Such a machine would be helpful in utilising fish which are not valued as food on account of these extreme boniness.

3. Objectives:

Design and fabrication of (i) dewaterer for cooked fish, and (ii) meat picker for raw or cooked fish.

To set the pace for indigenous fabrication of fish processing machinery.

4.1. Nature of investigation: Applied

4.2. Classification: Design and fabrication

4.3. Orientation: Import substitution

5. Period: April 1975 to March 1979.

Discipline: Experiment
Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Freezing of fish: Development of new technique; freezing of fillets and ready-to-use precooked fish products and study to improve quality of products.

2. Justification:

Foreign exchange to the tune of Rs. 35 crores is being earned by the seafood freezing industry in India by the export of frozen shrimp lobster and frog legs. Retention and expansion of this foreign market in the face of competition and increased quality stipulation by the buyers, is possible only by efforts directed at solving the technological problems associated with the freezing industry. New technology using liquid nitrogen freezing techniques have to be adopted to improve the products further.

3. Objectives:

- i) To overcome or minimise problem of rancidity in frozen stored fish and frozen products.
- ii) To minimise adverse effects of freezing and texture of the product and drip losses.
- iii) To evolve improved techniques for adopting by the Indian Seafood Industry
- iv) To prepare frozen fish fillets and ready-to-eat frozen fish products.

4.1 Nature of investigation: Applied

4.2 Classification: Process & Product Research

4.3 Orientation: Export Promotion

5. Period: April 1975 to March 1980.

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation of smoked fish products

2. Justification:

Smoking offers one of the convenient and easy ways to prevent development of rancidity in oily-fish. In addition, smoked flavour is highly acceptable. In our country oily fish like oil-sardine and mackerel together constitute about 40% of total marine landings. Smoking technique may be highly useful in the development of products from these fishes and also from other varieties.

3. Objectives:

- i) The project aims to develop smoked fish products of high palatability
- ii) Development of new products will be useful for the better utilisation of our fish resources.

4.1 Nature of investigation: Applied

4.2 Classification: Product and Process
Research

4.3 Orientation: Raw material utilisation

5. Period: April 1976 to March 1979.

Discipline: Experiment Station,
Mangalore

1. Project Title:

Refining of commercial fish oils

2. Justification:

About 4,000 tonnes of sardine oil is produced by traditional methods. The quality of such product is very poor and has very limited use. Improvement of quality is essential to put the oil to better and more worthwhile use.

3. Objectives:

- i) To standardise commercial processes for refining of fish oils
- ii) To increase returns to fish oil processors through upgrading of quality of commercial products

4.1 Nature of investigation: Applied

4.2 Classification: Process Research

4.3 Orientation: Wastage utilisation

5. Period: September 1974 to May 1978.

Discipline: Sensory
Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality in Meat, Fish and Poultry products.

2. Justification:

India's meat production is estimated at 739,000 tonnes. About 3,000 tonnes of meat and meat products are exported fetching Rs. 40 million. India's fish production is 22,98,000 tonnes. The export of marine products fetches Rs. 4 lakhs. India's egg production is about 78,000 tonnes. Quality assessment of these meat, fish and poultry products with regard to consumer requirements is not fully understood and sensory evaluation is of great importance.

3. Objectives:

To develop subjective methods and correlate them to selected objective methods for quality control for excellence and preparing draft standards of quality.

4.1 Nature of investigation: Applied

4.2 Classification: Materials and Product Research

4.3 Orientation: Raw material utilisation/
Welfare/Export Promotion

5. Period: April 1974 to March 1979.

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Formation and changes in aroma compounds of oils and fats.

2. Justification:

India produces about 2 million tonnes of edible oil and 600 million kg. of butter. People in different regions show definite preference to oil with varying flavour. The types of oils and fats in the market vary widely in quality and very often has off-flavour notes. A study on the nature of desirable and off-flavours, that develop in these edible fats and oils will lead to better manufacturing practices and storage conditions.

3. Objectives:

In the first instance the study will be oriented towards ghee. This study is to identify and understand the mechanism of formation of desirable and undesirable aroma that develop in ghee.

To eliminate the off-flavour that might develop during processing and storage and prolong the storage life.

Extend the study to other edible oils and fats.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Raw material utilisation/
Improvement of quality

5. Period: April 1974 to March 1979.

Discipline: Engineering &
Maintenance

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Developmental work on Instrumentation -
Design and fabrication of -

- i) Thermal conductivity gas analyser
- ii) Such other instruments as may be required for different research project activities.

2. Justification:

Can be widely used in pest control and grain storage work - for monitoring fumigant concentrations in fumigated storage facilities like godowns, warehouses, shipholds, fumigation chamber and research on fumigant gases. There is a good demand for such an instrument in the country.

3. Objectives:

To aid in speedy implementation of research projects of the Institute through instrumentation and to develop new instruments for quality control work.

4.1 Nature of investigation: Applied

4.2 Classification: Design and fabrication

4.3 Orientation: Import substitution

5. Period: April 1974 - March 1977

Note: The instrument section is also engaged in day to day operation and maintenance of all scientific instruments which are used in the Institute. These include electron microscope, amino acid analyser, vapour phase chromatograph, spectrophotometer, etc. A regular system of preventive maintenance procedure for all these has been organised.

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of supplementing weaning foods and protein foods on the growth of infants and malnourished children.

2. Justification:

Diets consumed by large majority of infants and children in our country are deficient in proteins, calories, essential vitamins and minerals. As a result, they grow at a sub-normal rate and stunted with poor musculature. They also suffer from signs and symptoms of protein-calorie malnutrition. The most promising additional sources of proteins available in our country are the various edible oilseeds and nuts and their meals. Several types of weaning foods and protein foods suitable for supplementing the diets have been developed at CFTRI. There is an urgent need to test these foods.

3. Objectives:

Clinical evaluation of infant foods, weaning foods and protein foods on infants and malnourished children.

Improve the nutritional status and promote optimum growth in infants and children belonging to the low income groups of the population in the country.

4.1 Nature of investigation: Applied

4.2 Classification: Product Research

4.3 Orientation: Welfare

5. Period: April 1974 to March 1979.

Discipline: Biochemistry and Applied
Nutrition.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Preparation of solid state enzymes (to be used in food industries).

2. Justification:

Enzyme treatment of fruit juices, preparation of sugar syrup and preparation of mononucleotides are some areas in which this approach can be useful. Use of enzymes in this form is likely to result in a more refined product. This area of research is in its infancy in foreign countries and is said to have considerable potential in food industries.

3. Objectives:

To find out optimum conditions for attachment of an enzyme to solid state by repeating established processes in literature. Enzymes like monoesterases, beta-amylglucosidase will be tested initially.

To put on the market indigenously prepared solid state enzymes for use in food industries. This will result in economical use of enzymes and prevent side reactions in the desired product.

4.1 Nature of Investigation: Applied.

4.2 Classification: Product research.

4.3 Orientation: Conservation.

5. Period: April 1974 to March 1979.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the processing and utilization of sunflower and safflower seeds for edible oil and protein products.

2. Justification:

Safflower: The annual production of safflower is about 200,000 tonnes. The oil is highly valued for its high content of polyunsaturated fatty acids and the protein is a fairly good source of sulphur amino acids. The seed has 35-45% of hull fraction. Development of suitable methods of dehulling the seed and its further processing would yield good quality edible oil and a flour rich in protein.

Sunflower: This seed offers great potential for cultivation in India and hence been included in the agricultural planning for intensive development. Selected Russian varieties of sunflower are under experimental cultivations in different parts of the country. The oil is considered as one of the finest among edible oils and the protein is reported to be rich in methionine. The seed has a brittle hull fraction constituting 35-40% of the weight of the seed. Suitable methods for dehulling the seeds and its further processing have to be developed.

3. Objectives:

- i) Process development work on the dehulling of safflower and sunflower.
- ii) Standardizing optimum conditions of processing the dehulled seed.
- iii) Studies on the chemical and organoleptic characteristics of dehulled seed, oil and flour.
- iv) Utilization of the edible flour in processed foods.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process Research/Product Research.

4.3 Orientation: Conservation/Raw material utilization.

5. Period: April 1974 to March 1979.

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Process Development studies on the separation of protein and carbohydrate fractions from cereals and legumes.

2. Justification:

With the increased production and availability of fine and coarse cereals as also legumes in the country, it is anticipated that some of these can be used as raw materials for further processing into refined products such as prime quality starch and protein concentrates. New processes for the separation of starch and protein fractions from wheat flour have been reported. The applicability of such methods in the case of readily available raw materials in the country would merit study.

3. Objectives:

To evolve improved techniques of separation of protein carbohydrate fractions from cereals and legumes and carry out bench scale process development studies.

4.1 Nature of Investigation:

Applied.

4.2 Classification:

Process Research/Product research.

4.3 Orientation:

Conservation/ Raw material utilization.

5. Period:

April 1974 to March 1979.

Discipline: Protein Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of nutritious/,ready-to-use protein foods based on oilseeds and legumes, in the form of flakes or grits.

2. Justification:

Conventional items of ready-to-eat snack foods commonly purchased by the average people are based on single cereals, legumes or oilseeds. There is considerable scope to develop nutritious, high-protein products (flakes and grits) based on a mixture of cereals, legumes and oilseed flours.

3. Objectives:

i) Formulation of the basic chemical composition, ingredient and flavour profiles of the product.

ii) Standardization of the processing methods and technology.

iii) Chemical, physico-chemical, nutritional and organoleptic properties of the product.

iv) Shelf-life, packaging and promotional aspects.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process research/Product research.

4.3 Orientation: Conservation/Raw material utilization.

5. Period: April 1974 to March 1977.

Discipline: Protein Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of nutritious candy or chikkie like products based on oilseeds and legumes.

2. Justification:

Candies and chikkies are popularly used by all sections and age groups. Enrichment of these with proteins of balanced amino acid composition as also with minerals and vitamins can serve to improve the nutritive value of the products.

3. Objectives:

i) Formulation of the basic chemical composition ingredients and flavour profiles of the product.

ii) Standardisation of the processing methods and technology.

iii) Chemical, physico-chemical, nutritional and organoleptic properties of the products.

iv) Shelf-life, packing and promotional aspects.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process research/Product research.

4.3 Orientation: Conservation/Raw material utilization.

5. Period: April 1974 to March 1977.

Discipline: Protein Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of simulated meat-like products from vegetable protein concentrates and isolates by extrusion-cooking technique.

2. Justification:

The possibility of obtaining a variety of simulated meat-like products from vegetable proteins has been established. Extrusion-cooking and puffing technique offers many advantages in the manufacture of such products and is finding increasing applications in the developed countries. By a careful choice of raw materials and conditions of processing, it is possible to modify the product characteristics.

3. Objectives:

- i) Study of the behaviour of different raw materials in the extrusion-cooker.
- ii) Development of textured protein foods based on vegetable protein concentrates and isolates.
- iii) Chemical, physico-chemical/nutritional and organoleptic properties of the product.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process research/
Product research.

4.3 Orientation: Conservation/Raw
material utilization.

5. Period: April 1974 to March 1977.

Discipline: Protein Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of nutritious high protein ready mixes for traditional Indian sweets and savouries.

2. Justification:

The traditional sweets and snacks commonly used are based on cereal flours, legume flours and milk solids. Bengal gram flour is more frequently used in a number of preparations, while black gram goes into certain specialized items. There is scope for developing ready mixed for many of the preparations. These can also be made nutritious by enriching with proteins, minerals and vitamins. Considerable demand exists for such ready mixes in view of the convenience of preparation.

3. Objectives:

i) Study of the suitability of new raw materials such as oilseed flours and protein products for incorporation in ready mixes for selected sweets and savouries.

ii) Chemical, physico-chemical nutritional and organoleptic properties of the preparations.

iii) Shelf life, packaging and promotional aspects.

4.1 Nature of investigation: Applied.

4.2 Classification: Process research/Product research.

4.3 Orientation: Conservation/Raw material utilization.

5. Period: April 1977 to March 1979.

Discipline: Protein Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of high protein foods for dietetic uses.

2. Justification:

Special kinds of protein foods are needed to meet the nutrition needs of people under varying conditions of health as well as periods of physiological stress. The aged, obese, diabetic and persons suffering from various other types of diseases require such specially designed or processed foods. These foods are expensive, as they are based on animal proteins and are not within the reach of the poorer sections of the people.

3. Objectives:

Development of easily assimilable high protein foods for specialized dietetic uses.

4.1 Nature of Investigation: Applied.

4.2 Classification: Process research/
Product research.

4.3 Orientation: Conservation/Raw
material utilization.

5. Period: April 1977 to March 1979.

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Discipline: Infestation Control &
Pesticides

SUMMARY OF PROJECT PROPOSALS

1. Project Title:

Physical methods of control of insects
in grain products

2. Justification:

The project is arrived at the development of
safe methods of insect-control.

3. Objectives:

Employment of impact machines, heat,
ionizing radiations, electrical energy,
cold and ultrasonic devices for insect control
in raw agricultural produce as well as food
processing and packaging establishments.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: -

4.3 Orientation: Welfare/Conservation

5. Period: April, 1975 to March, 1979

Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Control of mites and insects in dried fish
and prawn

2. Justification:

Infestation of mites and insects is a serious
problem during storage and export of dried fish
and prawn. A fumigation treatment that would
control the mites and insects without affecting
quality of the materials is needed by the
industry.

3. Objectives:

1. Screening and selection of most effective,
yet safe fumigants
2. Formulation of codes of practice for large
scale use

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials research/
process research

4.3 Orientation: Export promotion/
Welfare/Conservation

5. Period: April, 1977 - March, 1979

Discipline: Infestation Control &
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Hermetic and aseptic storage of grains with inert gases and modified atmospheres (with and without fumigants) for stored products insect and mould control

2. Justification:

With the spectre of pollution looming large more and more emphasis will have to be laid on development of safe methods of control of insects and moulds in stored foods and products. The project is an effort in this direction, with newer and safer techniques of storage without the use of toxic pesticidal chemicals.

3. Objectives:

Development of residue-free gaseous sanitation treatments for the control of insects and moulds in foodstuffs. To control insects and moulds in stored grains by ecological measures and environmental control.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials Research/
Process Research

4.3 Orientation: Food Sanitation and Health

5. Period: October, 1974 to October, 1979

Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of the physical and chemical factors for reducing the insecticidal level in certain food materials.

2. Justification:

Preliminary work conducted in the Institute has revealed that majority of the samples received from different parts of the country contain insecticidal residues far in excess of the permissible limits prescribed by USFDA. Hence, they are rejected as unfit for human consumption or animal feeds; this constitutes a huge wastage of nutritive food material. Reduction of the insecticidal residues below the permissible limit in highly contaminated food materials can thus help in extending the food supplies either for human consumption or for animal feed purposes.

3. Objectives:

Standardisation of procedures for the decontamination of the selected food materials on experimental scale and their commercial application.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Process Research

4.3 Orientation: Raw material
utilisation

5. Period: April, 1975 - March, 1980

Discipline: Infestation Control and
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Screening and isolation of active
insecticidal principles occurring in
plant products

2. Justification:

Future emphasis on insect control would be on the development of natural products from plant materials to safeguard against pollution from toxic residues of organic insecticidal chemicals. Synergizing already available plant insecticides like pyrethrin has resulted in more insecticidal potency. Similar work is necessary for other candidate plant insecticides like nicotine, derris, Auora, etc.

3. Objectives:

- (a) Screening plant products - both known and unknown insecticidal value
- (b) Isolation of the active principle
- (c) Potentiation and synergism by admixture with other materials.
- (d) Concentrated work on the most promising material

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials Research

4.3 Orientation: Welfare/Conservation

5. Period: April, 1975 - March, 1979

Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Survey and isolation of insect pathogens
for use in the control of stored products
insects

2. Justification:

Accent will be placed more and more on
biological and integrated control of insects
to minimise or even eliminate hazardous
chemical control agents. Scouting of
naturally occurring pathogens must go on to
detect effective species and strains.

3. Objectives:

(a) Scouting and screening for prospective
pathogens infecting insects (fungi,
bacteria and protozoa).

(b) Culture methods for mass production

(c) Formulation for effective deployment

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Product research

4.3 Orientation: (Organic chemical
insecticides) substi-
tution, export
promotion, conserva-
tion

5. Period: April, 1974 - March, 1979

Discipline: Infestation Control &
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Pharmacology and toxicology of residual insecticides and fumigants: Long term studies on albino rats.

2. Justification:

Enough information is not at hand to classify insecticidal chemicals and fumigants residues as regards their safety on prolonged use at various levels of nutrition of populations, long term studies are important for the determination of the dietary level of the compound which produces the effect, particularly when dealing with compounds that do not produce any measurable biochemical changes (FAO & WHO Reports).

3. Objectives:

Evaluation of toxicity of pesticide residues in treated foodstuff as evidenced by rat-feeding experiments (metabolism, histopathological studies) insecticides and fumigants.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Product Research

4.3 Orientation: Welfare

5. Period: April, 1978 to March, 1979
(spills over to VI Plan)

Discipline: Infestation Control
& Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Screening and development of chemosterilants and attractants for controlling commensal rodents

2. Justification:

The resistance exhibited by animals to chemicals has puzzled the chemists and biologists in recent years. One of the striking examples of this phenomenon is the resistance offered by rodents to warfarin (an anticoagulant rodenticide). Other measures for overcoming this problem have, therefore, been explored through the development of chemosterilants and biological control.

3. Objectives:

Development of safe, selective, palatable and efficient chemicals for inhibiting the reproduction of rodents and formulation of baits and adjuvants for attracting rats.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials research

4.3 Orientation: Conservation &
Welfare

5. Period: May, 1976 to May, 1979

Discipline: Infestation Control &
Pesticides

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Pilot Survey of chemical pollution of foodgrains, fruits and vegetables in selected markets and corresponding consumer households.

2. Justification:

In a study (Dale, et al), civilians and military personnel in Delhi having no occupational exposure to DDT have been shown to have 12.8 - 31 ppm of DDT in their fat (permissible limit = 7 ppm). The greatest hazard from chemical pollution in rural and urban areas comes from ".....use of DDT & BHC by unscrupulous grain merchants" (Srivastava, Pan. Vol. 16, No.2, June, 1970, p. 268). Analysis done by ICP on some samples of potatoes, green leafy vegetables and meats from Mysore market have shown various degrees of pollution with insecticides like DDT, dieldrin and parathian. At present almost no data on food pollution in India is available (FAO No.TA 2628, p.2). It is necessary to survey the actual insecticide pollution of raw materials in markets and corresponding cooked dishes in family kitchens. A pilot survey of this holistic type would give clear insight into actual problems of pollution and suggest methods of safe and efficient methods of pesticide application & methods of removal of chemical residue.

3. Objectives:

To study through survey the actual chemical pollution of foods in selected houses, markets, hotels, hospitals etc. To regularise the pilot survey data and channelise the baseline data for use and extension through other departments like (i) Department of Health and Sanitation, (ii) Agriculture and Plant protection, (iii) Maternal and Child Welfare Programmes and (iv) Farmers' Cooperatives.

- 4.1 Nature of Investigation: Application oriented
basic
- 4.2 Classification: Extension(Survey)
- 4.3 Orientation: Welfare
5. Period: July, 1975 to December, 1980

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on low temperature breakdown in mangoes.

2. Justification:

Low temperature storage is the only known economical method for long term preservation of fruits and vegetables. In view of this, refrigeration industry has expanded many fold in the last decade from 59,000 tonnes storage capacity to over 10,00,000 tonnes in commercial stores. Fruits and vegetables of tropical origin develop low temperature breakdown when exposed to temperatures below the critical levels and such perishables do not ripen properly, develop scalded patches resulting in discolouration and total destruction. Low temperature breakdown is a major problem in mango storage. Factors causing this low temperature breakdown in Mangoes are not known yet.

3. Objective:

This study envisages to examine the causes for this storage disorder so that a working hypothesis could be drawn on a sound basis based on experimental evidence and remedial measures could be postulated.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Material research

4.3 Orientation: Export promotion/
Conservation

5.0 Period: April 1976 to
March 1979

Discipline: Fruit & Vegetable
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Extension of Storage lives of pineapple and papaya by low dose gamma irradiation, mild refrigeration and combination treatments.

2. Justification:

Pineapple, fresh as well as slices are being exported abroad. In the next 4-5 years about 15,200 tonnes of fresh pineapple and slices worth Rs.2,57,00,000 would be exported. Papaya is one of the most common fruits grown in India. In view of its large production there is a possibility of this fruit being exported if proper maturity standards, suitable packages during transit and adequate facilities for storage and transport and export are standardised. Pineapple and papaya being perishable suffer heavy loss (about 20%) during storage and transportation because of high metabolic activities which continue after harvest till they are marketed and also due to fungal attack, fruit flies etc. Gamma irradiation with or without refrigeration, fungicides, growth hormones, antibiotics would cut down the spoilage and improve the quality of the fruit and extend the storage life.

3. Objectives:

1. To determine the best maturity for papaya fruit.
2. To standardize the packaging during transit for papaya fruit.
3. To standardize the optimum dose of gamma irradiation.
4. To determine the best developmental stage for irradiation.
5. To find out the effect of combination treatments on the quality and storage life of pineapple, pineapple slices and papaya.
6. To extend the storage life of pineapple, pineapple slices and papaya.

4.1	<u>Nature of Investigation:</u>	Application oriented basic
4.2	<u>Classification:</u>	Process Research
4.3	<u>Orientation:</u>	Wastage utilization
5.0	<u>Period:</u>	March, 1974 to February, 1979

Discipline: Plantation Pro-
duct and Flavour
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Improvements in the quality of Indian
Teas.

2. Justification:

There is a rapid increase in the production of black tea especially in the African countries compared with India. In order to be in a highly competitive position during the coming years, investigations have to be carried out to improve the quality of Indian teas and prevent the loss of quality during storage and transport.

3. Objectives:

To establish taste thresholds for the different constituents of tea separated by the modern separation techniques and to understand factors influencing quality.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Product research

4.3 Orientation: Welfare, Conservation

4.4 Collaboration: Sensory Evaluation

5.0 Period: From April 1976 to March, 1979

Discipline: Plantation Products
and Flavour Technology.

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Compounding of flavour for meat like products and fermented beverages.

2. Justification:

Flavour is an important quality determining factor in foods. There is a limitation for the production of meat products in the country. The possibilities of producing meat like products from vegetable proteins are great. With the relaxation of prohibition policy there is a boost in the development of fermented industries. With this increased production of Indian made foreign liquors there is a justification for development of better flavours. Production of hop flavour for beer itself will be helping the industry.

3. Objectives:

To study the natural flavours and compounding suitable flavours for the above products. Studies on characterisation and changes during storage will also be taken.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Product research

4.3 Orientation: Import substitution
and raw material utilisation.

4.4 Collaboration: Discipline of Sensory
Evaluation.

5.0 Period: From April 1975 to
March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of supplementing poor cereal diets based on different cereals and millets with legumes and processed protein foods on the growth and metabolism of nitrogen, calcium and phosphorus in children.

2. Justification:

Malnutrition and undernutrition are widely prevalent among the vulnerable sections of the population belonging to the low income groups. There is urgent need to produce in large quantities of low cost supplementary foods such as legumes and processed protein foods based on oilseed meals for use as supplements to the diets. With a view to meet the nutritional needs of the rapidly growing population, it is essential to increase the production of cereals, legumes and oilseeds.

3. Objectives:

To find out the low cost supplements for making up the dietary deficiencies and for improving the growth and nutritional status of children.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials research

4.3 Orientation: Welfare

5.0 Period: April 1974 to
March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Possibilities of utilizing sal fat, acute or chronic toxic factors (if any) associated with the feeding of sal (Shorea robusta) fat.

2. Justification:

Sal (Shorea robusta) fat is mainly used as a substitute for cocoa butter in the manufacture of chocolates. The fat is used sometimes as a luminant and as an adulterant for ghee. The seeds are eaten whole in times of famine. Except for data on the physical and chemical characteristics of sal fat, no information is available on its nutritive value. Since the fat is now used for edible purposes, there is a necessity for a study on the nutritive value of the fat and on the possibility of acute or chronic toxicity associated with the feeding of the fat. There is a demand for sal fat, which can be used as a substitute for cocoa butter in European countries and considerable foreign exchange can be earned.

3. Objectives:

To study (i) the nutritive value of sal fat and (ii) the possible toxic effects associated.

To increase considerably the demand for sal fat in the country.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials research

4.3 Orientation: Raw material utilisation, export promotion

5.0 Period: April 1977- December
1979.

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Identification and utilization of carbohydrates in oilseed meals.

2. Justification:

Oilseed meals are increasingly being used for the preparation of processed protein foods. The oilseed meals so far were studied only in view of their protein content. No data is available on the nature and availability of the carbohydrates present in the oilseed meals. How the carbohydrates present in the oilseed meals affect the absorption of other nutrients is now known. There is a great need to study the role of the carbohydrates in oilseed meals, in nutrition, since the oilseed meals are being used as supplements to the dietary.

3. Objectives:

To identify and evaluate the utilization of oilseed carbohydrate fraction from the stand point of (i) digestibility and (ii) effect on the utilization of other nutrients, especially protein.

To determine the safe levels of oilseed meals that can be incorporated into normal dietaries for optimum nutrition.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials research

4.3 Orientation: Raw material utilization

5.0 Period: April 1974 to
March, 1979

Discipline: Biochemistry and
-Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Post harvest biochemical changes in fruits and vegetables.

2. Justification:

Numerous parameters that control the behaviour of fruits and vegetables after harvest are not completely elucidated for the tropical fruits-mango and banana. Condition for the controlled atmosphere storage have to be worked out. Causes for low temperature injury have to be elucidated. Data collected in this work will be of use in evolving condition for optimum storage and transport.

3. Objectives:

To find out whether compounds which act as substrate have any regulatory role in enzyme activities of stored fruits and vegetables after harvest.

To help evolve standard conditions for transport and storage under optimum conditions of tropical fruits and vegetables.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials research

4.3 Orientation: Conservation

5.0 Period: April 1974 to
March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Chemical and enzymic modifications of vegetable proteins with particular reference to gel formation.

2. Justification:

There have been no systematic efforts to modify the vegetable proteins, other than soya proteins, so as to induce desirable technological properties such as easy dispersion in aqueous media and gel formation suitable for making cheese like products and other textural properties. The standardization of conditions for making such tailored proteins would greatly extend the practical application of the major oilseed and other plant proteins available in India and lead to important technological developments in the protein field.

3. Objectives:

(i) To determine the conditions under which proteins from vegetable sources (peanut, sesame and cottonseed) could be rendered suitable for formation of gels for making cheese-like products through appropriate treatment with chemical and enzymic agents;

(ii) To extend the above studies and correlate the structural changes induced by the various physical, chemical and enzymic agents with the physico-chemical properties induced and formulate condition for modifying vegetable proteins for desired food technological purposes.

4.1 Nature of Investigation: Application oriented basic

4.2 Classification: Materials research

4.3 Orientation: Raw material utilisation

5.0 Period: April 1974 to April 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on protein synthesis and other metabolic processes under nutritional stress conditions with special reference to protein, riboflavin and nicotinic acid levels in the diet.

2. Justification:

Till now the gross effects as depicted by PER, NPU, growth rates and overall influence in animal and human feeding experiments and are taken as the criteria for assessing any processed product. The data obtained in these studies are adequate from a practical approach.

Recent trends in nutritional biochemistry have indicated that the parameters involving ribosomes, polyribosomes and the ratios concerning these are very meaningful in assessing the protein synthesising mechanisms in the cell and the nutritional value of proteins. Studies involving these particles in partial deficiency states involving protein and B-vitamin levels will yield very valuable and dependable information on the nutritional status of the experimental animal, the nutritive value of the protein, etc.

3. Objectives:

- (i) To study the protein-synthesising capacity and catabolic activities of specific tissues (liver, intestine, kidney) under various dietary conditions with special reference to protein, riboflavin and nicotinic acid status in the diet;
- (ii) To standardise methods involving polyribosomes for more intensive studies;
- (iii) To evolve a quick and reliable method for assessing the value of the products.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Materials research

4.3 Orientation: Welfare

5.0 Period: April 1974 to
March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Effect of processing on plant based protein foods.

2. Justification:

Several plant based processed products such as infant weaning food and Miltone have been developed at CFTRI. One of the important factors that affect good quality protein products is the browning reaction between amino acids and carbohydrates during processing. Also, processes developed for removal of aflatoxin such as H_2O_2 treatment may result in nutritional damage to the protein. Studies on these aspects will be useful in developing appropriate quality control methods and to formulate optimal processing conditions for maximal retention of nutritional value of the protein in the processed product and hence considered to be of economic importance.

3. Objectives:

To ascertain chemical and nutritional changes that occur in protein foods during processing and to suggest appropriate modification in processing techniques to minimise nutritional loss; To develop simple chemical methods for in-plant use and quality control in the protein food industry; To characterise the nature of amino acid-carbohydrate interaction products; To identify the reaction products responsible for desirable and undesirable 'flavour' in the course of processing the protein-carbohydrate mixtures for production of various protein foods; To develop possible means of using these identified reaction products as acceptable new flavour components especially to utilise protein hydrolysates from food industry wastes.

4.1 Nature of Investigation: Application oriented
basic

4.2 Classification: Product/Process
research

4.3 Orientation: Conservation/welfare

5.0 Period: April 1976-March 1979

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Enzymes in relation to food

2. Justification:

Enzymes such as phosphodiesterase, catalase, acid-protease, glucose isomerase, cellulase, thioglucosidase, amyloglucosidase, are used for certain specific purposes. Bacterial phosphodiesterase has been used for production of meat-flavouring compounds, catalase for two processes in the CFTRI, thioglucosidase could be of use in mustard from processing, glucose isomerase for conversion of glucose to fructose, etc. These enzymes are present as mixtures in the microbial growth media or in the micro-organisms and the latter may even contain some toxin. By separating them, their economic value is enhanced.

Many enzymes are used in food industry and some have been mentioned above. To this, cellulase and glucose isomerase can be added. Cellulose is available in abundance as waste material and is a potential source of glucose. A good source of cellulase will be a critical factor in rendering cellulose useful for food purposes. Besides, there is not much work on the physico-chemical properties of the enzymes, and some of them isolated by the Microbiology Discipline seem to be new ones. Hence a detailed study of at least some of these enzymes would be most desirable and useful.

- | | | |
|-----|---------------------------------|----------------------------------|
| 4.1 | <u>Nature of Investigation:</u> | Application oriented
basic |
| 4.2 | <u>Classification:</u> | Materials research |
| 4.3 | <u>Orientation:</u> | Food and Agriculture,
Welfare |
| 5.0 | <u>Period:</u> | April 1974 to
March, 1979 |

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on single cell protein

2. Justification:

Work in recent years in many laboratories has shown that yeast and bacteria, which can be used as food material, can be grown on petroleum hydrocarbon. The growth of yeast on molasses, sulfite waste liquor and wood hydrolysates has long been known. These provide a cheap and abundant supply of proteins. However, the digestibility of yeast (or bacteria) is low. Their high nucleic acid content is also harmful. Also, the presence of toxic factors is suspected. These difficulties for use as human food can be overcome if a protein concentrate can be prepared from yeast or bacteria, instead of using yeast or bacteria as a whole.

3. Objectives:

(a) To obtain a protein concentrate from yeast, free from nucleic acid and cell wall contamination, which can be used as a human food.

(b) To utilize the protein, if necessary after further processing, in milk-like beverages and in the preparation of textured proteins.

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Process Research and
Product Research

4.3 Orientation: Conservation

5. Period: April 1974 to March 1979

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Food borne microbial toxins: their detection
and elimination or inactivation

2. Justification:

High hepatotoxicity and nephrotoxicity of a few known fungal metabolites point out the probable existance of more toxic compounds which may be doing great harm to the health of the community. With the increasing number of diseases of unknown aetiology, clinicians feel helpless to give any relief to the ailing population. Collection of epidemiological data to spot out the disease and related microbial toxins will help in working out remedial measures to save the population. This calls for both chemical and biological approaches on a priority basis.

3. Objectives:

We are isolating a large number of fungal species during the foodgrain survey. It is planned to examine the potentialities of these organisms to inactivate one or more fungal toxins

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Welfare

5. Period: April 1974 to December 1978

Discipline: Microbiology, Fermentation
Technology & Sanitation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Survey of byproducts of food and fermentation industries and their fermentative utilization with special reference to microbial production of fat

2. Justification:

There is a shortage of both edible and non-edible fats and oils in the country. About 45,000 tonnes of edible fats and oils worth about 107 million rupees were imported in 1969. Microbial fat has already proved to be of very high quality and it would be worthwhile to explore the possibility of producing fat by micro-organisms using cannery wastes, sulphite liquor and molasses as cheap carbohydrate source

3. Objectives:

To produce microbial fat on large-scale by using industrial wastes available in the country

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Product Research

4.3 Orientation: Wastage utilization

5. Period: April 1975 to March 1980

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Flavour Enhancement of Fishery Products

2. Justification:

The aim of the project is to improve the flavour of fishery products like Canned fish and shrimp, fish curries, soups, pastes and sausages by chemical additives and flavour concentrates. Although canned and frozen shrimp account for the bulk of exported fish at present there is a good demand for the above processed products including pickled fish. In the case of comminuted products, it might be possible to employ cheaper and less popular grades of fish. It may be stated that Indian Fishery is composed of miscellaneous varieties of fish unlike temperate countries and some of them like Perch, Seer or Pompret command a higher price. India has bright prospects of developing fish as a major export commodity (Tuna and Shell-fish) based on the rapid progress in recent years

3. Objectives:

To study the possibility of enhancing the flavour of processed products like canned shrimp and shrimp curry by suitable additives. Shrimp extracts as also flavour enhancers are already employed in U.S. It may also be possible to develop new fish products like fish soups, pastes and sausages, from cheaper and less-utilized fish varieties with the help of flavour enhancers.

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|-----|---------------------------------|----------------------------|
| 4.1 | <u>Nature of investigation:</u> | Application oriented basic |
| 4.2 | <u>Classification:</u> | Product Research |
| 4.3 | <u>Orientation:</u> | Export Promotion |
| 5. | <u>Period:</u> | April 1977 to April 1979 |

Discipline: Rice & Pulse Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Gums and mucilages of pulses and their influence on the milling characteristics of the grains

2. Justification:

Many pulses have a layer of gum or mucilage between the husk and endosperm. This is known to determine whether the pulse is a 'tight husked' or 'loose jacketed' variety. Studies on the chemical nature of these mucilaginous substances and the effect of different heat processing on their properties are necessary and useful in standardising suitable milling technology. The amount and nature of gums which is determined by the varietal, seasonal and regional variations influence the milling characteristics of pulses and affect the yield of dhal

3. Objectives:

To study the nature and influence of the gums on the milling characteristics of different pulses. Varietal variations will also be studied

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Wastage minimization

5. Period: April 1975 to March 1978

Discipline: Sensory Evaluation

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Quality Evaluation of Beverages,
i) Tea, (ii) Coffee, and (iii) Cocoa

2. Justification:

India exports 420 million kgs. of tea, 50,000 tonnes of coffee and finished products incorporating cocoa. These products have growing export value. Quality evaluation of these products is done by a few experts of the Industries and the commercial firms and these do not generally relate to consumers requirements. For obtaining more objective assessment, panel evaluation based on description of quality parameters and their weightage to overall quality has to be developed. Quality control will then become more practical and widely used

3. Objectives:

To develop a pattern for training a panel and define procedures with weighted scale to evaluate tea, coffee and cocoa

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials and product research

4.3 Orientation: Raw material utilisation/
standardising procedures for
quality evaluation of specific products/export promotion

5. Period: April 1974 to March 1979

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Studies on the Flavour Components of Fish and Shell-fish with special reference to Volatile constituents

2. Justification:

Knowledge of flavour components helps not only consumer acceptance but also better quality control measures for freshness of marketed fish. Apart from the present target of Rs.100 crores for exports of fish products there is a good export potential for Tuna, Mackerel and Oil Sardine besides Shell-fish like Crab and Turtle meat. Rich stocks of Tuna exist in Indian Ocean as seen from Japanese catches (15,000 tonnes). Quality control of fish is gaining added significance with the development of off-shore and deep sea fishing

3. Objectives:

To obtain data on the distribution of free amino acids and nucleotides in Indian fish so as to study the chemical basis of flavour in fish. Of practical interest during this study will be the study of changes during the handling and ice-storage of fish and shrimp before processing which helps in improving the present practices of dressing and raw material storage in fish processing industry.

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Export promotion

5. Period: April 1975 to April 1977

Animal House

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Development of methods for bioassay of different mycotoxins isolated from food materials on developing chick embryos and cell culture lines

2. Justification:

Development of fungal agents on different food products such as *Aspergillus* and *Penicillia* that are capable of producing toxins like aflatoxin, ochratoxin and citrinin are not uncommon in the country. At present, the techniques adopted for their detection as well as assaying are quite lengthy and laborious since in most of them laboratory animals are used. For example, use of ducklings for bioassay of aflatoxin is a familiar method. But many a times healthy ducklings are difficult to obtain for proper testing. Hence it is worthwhile to develop suitable method either with embryonated eggs (from a more common source) or cell culture system so that the bioassay becomes easy, quick and economical.

Same is the case with other fungal toxins too. Since susceptibility of tissues obtained from different species varies, the first and foremost thing would be selection of different tissue culture systems that would give clear cut cytopathic effects at the shortest time possible for each type of toxin to be tested. Once it is established the cost of bioassay will work out cheaper since production of tissue culture slants are definitely less costly than the laboratory animals. Further, in the above system maintenance of homogeneity is easy and the errors due to environmental factors are almost nil.

3. Objectives:

Development of a easy, quick and economical method for assaying different fungal toxins commonly found in the food products

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Materials Research

4.3 Orientation: Conservation

5. Period: April 1974 to March 1977

Discipline: Experiment Station,
Mangalore

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Stability of pigment in semi-dried shrimp or prawn

2. Justification:

Semi-dried prawn is a traditional product of the West Coast. Despite the enormous growth of the frozen shrimp industry, this product continues to be produced, for, the raw material used is smaller shrimp not preferred by the freezers. There is a definite off-season internal market for the product (actual statistics of production not available). The export market is also not negligible. Despite the closure in recent years of the traditional Burmese market, new markets have been explored through the efforts of the Marine Products Export Promotion Council (vide Indian Seafood 1967, Vol.IV, No.4, page 27). It is presumable that the sustained expansion of trade in the new markets will be dependent on the quality of the product. Besides microbiological stability, the storage life of the product in terms of consumer appeal is related to the characteristic red coloured pigment which fades into an unattractive dull yellow colour in a matter of 1-2 months in the traditional product.

3. Objectives:

1. To work out a procedure for retention of the pigment in semi-dried shrimp or prawns during storage.
2. To improve the quality of commercial product.

4.1 Nature of investigation: Application oriented basic

4.2 Classification: Product Research

4.3 Orientation: Raw material utilisation

5. Period: September 1974 to May 1978

Discipline: Protein Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Textured proteins from yeast

2. Justification:

Textured proteins resembling meat have been successfully prepared from soya bean protein and found acceptance in developed countries. Work done in CFTRI has indicated the possibility of preparing of textured protein from groundnut protein. Yeast has been grown on petroleum hydrocarbons and appears to be a promising protein source. Yeast is also a by-product from breweries and distilleries. However, no work appears to have been done on the utilization of yeast in the preparation of textured proteins. In view of the abundance and relative cheapness of raw material, work on this aspect is proposed to be taken up.

3. Objectives:

1. Processing of yeast to obtain textured proteins from yeast alone or in combination with vegetable protein.
2. Nutritional and sensory evaluation studies.

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| 4.1 | <u>Nature of investigation:</u> | Application oriented Basic |
| 4.2 | <u>Classification:</u> | Process Research and
Product Research |
| 4.3 | <u>Orientation:</u> | Conservation |
| 5. | <u>Period:</u> | April 1974 to March 1979 |

TITLES OF R&D PROJECTS PROPOSED FOR
V FIVE YEAR PLAN

" BASIC "

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5.	Study of intestinal absorption (<u>in vivo</u> & <u>in vitro</u>) of different food constituents (amino acids, vitamins, inorganic ions) under different nutritional conditions (protein malnutrition, deficiency of vitamin A, riboflavin and B ₆ , feeding guar toxin bean meal, etc.)	320
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Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Metabolic and biochemical aspects of spices

2. Justification:

Spices cover a wide range of botanical species and their active constituents just as broad a spectrum of chemical structures. Whereas all of them have a general secretagogue action, especially with reference to digestive organs, some of them have special attributes such as intestinal antiseptic (antibacterial) action, blood sugar and/or cholesterol lowering property, cholagogue activity, etc. and some are alleged to be even carcinogenic on prolonged use. Their secretagogue action may involve a direct stimulation of cells of the digestive glands, both enzyme and hormone secreting cells, and also the internal organs. The latter may also be a secondary tropic effect exerted by secretion and other gastrointestinal hormones. The active constituents are also known to affect the sensory mechanisms. All these conduce ultimately to increased food ingestion and better digestion, absorption and utilization of food constituents. While the pharmacological and related properties of some of the well-known species have been worked out to some extent, there are large lacunae in our understanding of their metabolic effects and the underlying mechanisms. Studies oriented to elucidate such action would lead to a more judicious use of spices and extend their use in the management of conditions involving metabolic disturbances.

3. Objectives:

To study the metabolic effects of 3 or 4 chosen spices (pepper, coriander, chillies and ginger) and their major active constituents in terms of their effects on: general metabolism, (nitrogen, carbohydrate and lipid) and dynamic intermediary metabolites (blood amino acids, glucose, lipids, ketone bodies, cholesterol, etc.) secretions: (gastric, pancreatic and intestinal) and hormones (corticosteroids, growth hormones, insulin, etc.) and on the olfactory and gustatory sensors (through in vitro physiological set-up) and also their effects on synthesis and secretion of digestive enzymes (pancreatic and intestinal) and intestinal absorption.

4.1	<u>Nature of investigation:</u>	Basic
4.2	<u>Classification:</u>	Materials Research
4.3	<u>Orientation:</u>	Welfare
5.	<u>Period:</u>	April 1974 to April 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Use of tissue cultures in evaluation of some
plant growth regulators

2. Justification:

Tissue culture offers a very efficient technique of controlled growing of cells and studying their properties. A large volume of work has been reported with animal cells. Standardisation of conditions for growth has been accomplished in many labs. in India. There are two areas where tissue culture work is useful. Firstly, a study of the biosynthesis, if any, of the flavour compounds could be carried out. Such studies may lead to a better production of the flavour components although this at present is a remote possibility. Secondly the effect of plant growth regulators could be studied under fairly controlled conditions and may lead to a better understanding of their action and hence their use. Thirdly, the tissue culture technique is most suited to a study of differentiation, although this work is not planned here.

3. Objectives:

To standardise a method for evaluating the efficacy of plant growth regulators in plant systems. To evolve a suitable tissue culture technique for assessing the efficacy of the test compounds.

4.1 Nature of investigation: Basic

4.2 Classification: Materials Research

4.3 Orientation: Food and Agriculture

5. Period: April 1974 to March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Evaluation of the quality of proteins in lesser known food materials

2. Justification:

The production of small millets in India during 1969-70 amounted to 1.8 million tons. The production data for some individual millets were as follows: Little millet: 0.7 million tons; Varagu: 0.4 million tons and Italian millet: 0.2 million tons.

The production of some of the lesser known legumes such as kidney beans, white rongi, rajmah, lobia and those belonging to the Vicia Sp. and Cajanus bicolor has been estimated to be of the order of 6000 tonne in Himachal Pradesh alone. Data are not available regarding the availability of each type of bean in India.

The small millets are consumed generally by the poorer sections of the population in India.

3. Objectives:

To determine the limiting amino acids and availability of amino acids in these proteins using the blood amino acid technique. The supplementary relationship between the proteins of small millets and other legumes and oilseed meals will also be studied in order to develop formulations which can be used as Bal Ahar in the regions where these millets are grown. To study the chemical composition, nutritional quality of millets mentioned above. To identify legumes with good nutritional quality.

The objective is to improve the quality of the proteins in these foods by amino acid supplementation or mutual supplementation for the development of low-cost protein blends.

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| 4.1 | <u>Nature of investigation:</u> | Basic |
| 4.2 | <u>Classification:</u> | Materials Research |
| 4.3 | <u>Orientation:</u> | Raw material utilization/
Welfare |
| 5. | <u>Period:</u> | April 1974 to March 1979 |

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Role of fat soluble vitamins (A, E & K)
on cell membrane constituents

2. Justification:

Fat soluble vitamins - in particular vitamins A and K - have been implicated in maintaining cell membrane stability. Vitamin A deficiency has been reported to labilize lyso-somal membrane resulting in release of lysosomal enzymes (proteases, arylsulfatase, glucuronidase, etc.). This could explain some of the effects of vitamin A deficiency. We have observed increased excretion of urinary oligosaccharides in vitamin A deficiency tending to support this view. Studies on inter-relationship of vitamins A and K in maintaining membrane stability have been reported. But the biochemical basis of this 'membrane active' properties has not been clearly understood. It is the objective of this study to further the understanding in this area of nutritional biochemistry

3. Objectives:

(i) To delineate clearly the nutritional factors involved in cell membrane stability and to determine whether nutritional deficiencies cause specific qualitative and quantitative changes in the cell membrane constituents; (ii) Dietary toxins (microbial or other origin) can cause malignant growth and changes in cell surface charge have been reported. Whether nutritional deficiencies involving changes in cell membrane constituents 'predispose' the cell to malignant growth will be studied.

4.1 Nature of investigation: Basic

4.2 Classification: -

4.3 Orientation: Welfare

5. Period: April 1974 to March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Study of intestinal absorption (in vivo & in vitro) of different food constituents (amino acids, vitamins, inorganic ions) under different nutritional conditions (protein malnutrition, deficiency of vitamin A, riboflavin and B₆, feeding guar toxin bean meal, etc.)

2. Justification:

It is known from published work that during malnutrition, intestinal absorption is affected. What happens to individual amino acids, vitamins or inorganic ions is not so far clear. Vitamin A deficiency is fairly widespread in India and is known to affect the integrity of mucous membranes. Vitamin B₆ is intimately connected with amino acid metabolism and feeding of guar bean meal (which contains saponins) to rats leads to the disappearance of most of the microvilli which are the active absorbing areas of the intestines. Considering under and malnutrition in India, such studies are clearly important.

3. Objectives:

To ascertain the efficiency of in vitro absorption, of a basic, neutral and an acidic amino acid and Fe⁺⁺ ions under conditions of (a) adequate feeding, (b) protein deficiency, (c) vitamin A deficiency, and (d) B₆ deficiency; to extend these studies to other amino acids, vitamins and essential inorganic ions.

4.1 Nature of investigation: Basic

4.2 Classification: -

4.3 Orientation: Welfare

5. Period: April 1974 - March 1979

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Blood amino acid studies on legume and oilseed proteins to evaluate the optimal level of supplementation with the limiting amino acids or intact protein

2. Justification:

Legumes and oilseeds are important sources of proteins in Indian diets. Hence, studies on the improvement of the quality of these proteins by amino acid supplementation or mutual supplementation are of practical importance.

Legumes and oilseeds contribute about 20% of the total supply of protein in India. These proteins are much lower in cost than those of animal proteins. Studies on mutual or amino acid supplementation of legume and oilseed proteins will result in the development of low cost protein-rich formulations necessary to provide the additional proteins needed by the children and other vulnerable groups belonging to the low-income groups of the population in the country.

Feeding studies carried out on various legume and oilseed proteins have shown that these proteins are limiting in a number of essential amino acids such as lysine, methionine, threonine and tryptophan. Supplementation with the appropriate limiting amino acids results in a marked improvement in their nutritive value.

3. Objectives:

To determine the optimal level of supplementation of legume and oilseed proteins with the limiting amino acids in the free form or as intact protein from measurements of blood amino acid level and growth studies on rats.

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| 4.1 | <u>Nature of investigation:</u> | Basic |
| 4.2 | <u>Classification:</u> | Materials Research |
| 4.3 | <u>Orientation:</u> | Welfare |
| 5. | <u>Period:</u> | April 1974 to March 1979 |

Discipline: Biochemistry and
Applied Nutrition

SUMMARY OF **PROJECT** PROPOSAL

1. Project Title:

Studies on regulatory enzymes in the Metabolism of threonine and other aspartate family of amino acids

2. Justification:

Study of enzyme regulatory mechanism is important for a better understanding of metabolic control and since there is a lacuna of knowledge in this area, the work is important. The studies can be extended to cover the plants and to the other amino acids and their metabolism in animals (particularly in man during protein malnutrition - acute and chronic). A study of the enzymes responsible for degradation and biosynthesis of different amino acids during protein or vitamin malnutrition may provide information concerning the changes observed during protein malnutrition and during the metabolism of amino acids under normal conditions.

3. Objectives:

To study regulatory properties of aspartokinase, homoserine kinase, threonine synthetase and threonine deaminase of (i) the two bacterial species Serratia marcescens and M. glutaminus.

4.1 Nature of investigation: Basic

4.2 Classification: -

4.3 Orientation: Welfare

5. Period: April 1974 to March 1979

Discipline: Meat, Fish and Poultry
Technology

SUMMARY OF PROJECT PROPOSAL

1. Project Title:

Changes in nucleotides of meats during processing
and storage

2. Justification:

It is estimated that the total quantity of meat production in the country is 554 thousand tonnes and 55 per cent of this comes from sheep and goats. Recently seven modern bacon factories have been started under Public Sector. The processed meat production is about 3000 tonnes and this is expected to reach its target of 10,000 tonnes at the end of the IV Five Year Plan. By the end of V & VI Five Year Plans the production of meat and meat products will still increase. The flavour of the fresh meat and the processed meat products is dependent on its nucleotide concentration. It would, therefore, be worthwhile to determine changes in degradation of nucleotides and retention of these to obtain better quality meat products.

3. Objectives:

To determine initial concentration of nucleotides and changes effected in these on processing and storage. To improve the quality of the meat and the processed products therefrom, by standardising the optimum conditions for handling of animals, storage conditions for carcasses and the processing parameters for processed products with juiciness and characteristic aroma

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| 4.1 | <u>Nature of investigation:</u> | Basic |
| 4.2 | <u>Classification:</u> | Raw material and
Product Research |
| 4.3 | <u>Orientation:</u> | Development (industrial
& Economic)/Welfare |
| 5. | <u>Period:</u> | April 1975 to March 1977 |

PERSPECTIVES FOR THE VI FIVE YEAR PLAN
AREAS SUGGESTED FOR R & D PROJECTS

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46. To study snack foods, convenience foods including complete meal ranges for use in homes, school feeding programmes and institutional feeding. 369(d)
47. Study of flavour problems of newer varieties of the traditional and new agricultural raw materials that are and will become available during the V and VI plan periods and device newer uses for the same. 369(d)

PERSPECTIVES FOR THE VI FIVE YEAR PLAN -

AREAS SUGGESTED FOR R&D PROJECTS

1. (a) Title of the project:

B₁₂ deficiency, methylmalonic aciduria and lipid composition of membranes (particularly RBC & CNS myelin).

(b) Statement of the problem:

Vitamin B₁₂ deficiency has been shown to result in increased excretion of methyl malonic acid (MMA) since further metabolism of MMA to succinic acid is dependent on B₁₂-co-enzyme (Pediatrics, 46,497, 1970 and Lancet, 1, 424, 1967).

This accumulated MMA could be responsible for the observed effects of Vitamin B₁₂ deficiency namely (i) effect on central nervous system (ii) effect on maturation of the erythrocyte - leading to pernicious anemia. The biochemical basis for this is not understood. MMA could give rise to unnatural fatty acid in the cell lipids and thereby produce the effects attributed. This remains to be tested.

(c) Present status of research:

The biochemical reaction relating B₁₂ co-enzymes to fatty acid (propionate) metabolism is well understood. Measurement of MMA excreted as a test for B₁₂ def. has also been proposed. Whether MMA accumulation per se is 'toxic' and its effect on the CNS and bone marrow has not been investigated.

(d) Reasons for undertaking research:

It is of scientific and clinical interest to find out the exact mechanism by which erythropoiesis is affected. Folic acid deficiency while producing anemia does not affect CNS unlike B₁₂ deficiency. There must be specific reasons for this effect of B₁₂ deficiency on CNS in addition to Hemopoiesis. Hence it is of significance and usefulness to undertake this work.

2. (a) Title of the Project:

New methods for biological evaluation of proteins, use of amino acid antagonists such as ethionine and norlevine.

(b) Statement of the problem:

Bioassay methods for evaluation of protein quality presently include PER, NPU and biological value determinations. Each method has its particular advantages and disadvantages. Mere analysis of the amino acid content of protein and calculation of chemical scores have the limitations of not measuring exactly the biologically "available" amino acids. The use of specific anti-metabolites of essential amino acids may lead to simple and quicker bioassay procedures for evaluation of proteins.

(c) Present status of research:

Dietary ethionine, a metabolic antagonist of methionine, produces fatty infiltration of livers in female rats. Studies on this aspect are extensively documented. Our earlier studies (Proj.118) have shown that accumulation of glycoproteins on livers of rats and ethionine also occurs. Methionine supplement reverses these effects provided the ethionine level in the test diet does not exceed 0.1 - 0.15%.

It is proposed to take advantage of these observations to develop and standardise a simple short time (not more than 47 hrs.) bioassay procedure for evaluation of proteins in diets.

(d) Reasons for undertaking research:

Since a variety of protein food products are developed at CFTRI, biological evaluation of these protein foods and their effectiveness when supplemented to specified diets have to be carried out. In this context any new simpler method developed should be of interest.

3. (a) Title of the Project:

Utilisation of proteinaceous wastes from food industries.

(b) Statement of the problem:

Attempts to effectively utilise wastes from food industries such as fruit and vegetable processing factories or groundnut protein isolate or dairy plant are needed. Data available on the chemical nature of these waste materials are incipient and inadequate.

A comprehensive survey of these from the factories is the first necessity. Suggestions have been made, for instance, to utilize fruit and vegetable wastes for developing animal feeds.

Also the possibility of utilization of carbohydrate-rich wastes to be used for growing food yeast or bacteria to obtain protein is suggested. The present proposal is intended to be simpler in its aims for effective utilisation. Two facets of this are: (i) Production of protein hydrolysates from these wastes, and (ii) rendering the protein hydrolysate acceptable by addition of flavour components - derived mainly from amino acid esters. The latter aspect of developing new flavours (amino acid esters) is a new area of research.

(c) Present status of research:

No significant re-utilization of food industry wastes has been attempted. In fact, quantitative data on the amount of wastes (from fruit and vegetable industry) available is not adequate. No attempts have been made ~~to~~ so far to develop amino acid esters, as "flavour" components.

(d) Reasons for undertaking research:

Reutilisation of such wastes from food industry would definitely be of economic advantage.

4. (a) Title of the project:

Use of isoenzymes as diagnostic criteria in assessing nutritional stress conditions.

(b) Statement of the problem:

Attempts are being continuously made in various laboratories to associate a specific deficiency condition with a particular enzyme system.

(c) Present status of research:

It is well known that the pattern of lactic dehydrogenase isoenzymes in the serum reflects the nature of the pathological condition. Similar work is underway connecting the L-aspartate 2-oxoglutarate aminotransferase isoenzymes with either the protein status or with the pyridoxine sufficiency in the diet. In the next 7 years, it is to be expected that research in this field would be intense and will cover a wide range of stress conditions and the respective enzyme systems.

(d) Reasons for undertaking research:

By 1979, with a considerable amount of literature regarding the nature and behaviour of the various isoenzyme systems, experiments could be planned to diagnose conditions of protein deficiency (may be Kwashiorkor, etc.) liver malfunction and other nutritional disorder conditions by the isoenzyme patterns of some of the enzymes that would be flushed into the circulatory system.

5. (a) Title of the Project:

To assess the protein requirements of adolescents.

(b) Statement of the problem:

Different methods have been used to find out the minimum requirements of protein. Nitrogen balance method has widely been used. Changes in plasma protein levels, plasma urea levels and aminogram may be very helpful. Using different methods, efforts have to be made for assessing the protein requirements of adolescents.

(c) Present status of research:

In a recent review (J.Nutr., 101,385,1971) the various aspects of the protein requirements of different age groups have been discussed. From the data reviewed, it is clear that no data are available in literature on studies done on the requirements of adolescents.

(d) Reasons for undertaking research:

Adolescents constitute a group often presumed to be at high nutritional risk. Yet no studies have been done to assess their protein requirements, whereas adult men, women and premature infants have been studied thoroughly. This work will enable to arrive at suitable recommended allowances for protein for the adolescent group.

6. (a) Project Title:

Evaluation of the quality of proteins in minor millets and legumes.

(b) Statement of the problem:

Minor millets such as Italian millet, little millet, Sanwa millet, Varagu are staple foods in the diets of the low income groups of the population in certain parts of South India. Minor legumes such as rajmah, local beans, lobia, Bharat white rongi are consumed in certain parts of North India. No studies have been carried out on the nutritional quality of these foods.

(c) Present status of research:

The limiting amino acids in the minor millet and legumes have not been investigated. No studies have been carried out on the availability of amino acids in these proteins as measured by blood amino acid levels and the effect of supplementation of these proteins with the limiting amino acids on the protein efficiency ratio.

(d) Reasons for undertaking research:

A knowledge of the limiting amino acids in these foods is of importance, since they provide important additional sources of proteins in Indian diets.

7. (a) Title of the project:

Examination of strains of pulses and oilseeds free of toxic constituents from the technological and nutritional viewpoint.

(b) Statement of the problem:

Toxic components like gossypol, beta-oxaloamino propionitrile, linatine are constituents of edible protein sources. Attempts with chemical and physical means of induced mutations are likely to yield strains of seeds wherein these sources may not synthesize the toxins.

(c) Present status of research:

Not much literature is available wherein successful attempts are documented. The above approach has already given high yielding varieties of cereals.

(d) Reasons for undertaking research:

Newer varieties of legumes and oilseeds are being developed in the Indian Agricultural Research Institute. Some of these contain very little of the toxic components (e.g. lathyrus toxin) and others are bred for higher oil or protein levels. It should be possible to examine these numerous varieties for both nutritional adequacy and suitability for technological processing.

8. (a) Title of the project:

Assessment of the supplementary value of processed protein food to the diet of vulnerable groups through community nutrition centres in school, MCH Centres, creches and industrial centres.

(b) Statement of the problem:

In view of the widespread occurrence of malnutrition among weaned infants, pre-school, school children and expectant and nursing mothers, industrial workers, special attention has to be paid to the improvements of the diets of the above category of the population using processed protein foods, since there is shortage of milk and other sources of animal proteins.

(c) Present status of research:

Several types of protein foods suitable for vulnerable groups have been developed in the Institute which could be used as effective

supplements to their customary diet. This will make up the deficiencies and improve the diets of the people.

(d) Reasons for undertaking research:

No serious efforts have been made so far to introduce the low cost protein foods to the above segments of the population. Hence there is a necessity to undertake feeding trials in institutions to demonstrate the value of supplementary foods in improving the nutritional status of children.

9. (a) Title of the project:

Biochemistry of food flavours.

(b) Statement of the problem:

In continuation of the nutritional and biochemical studies on spices in the V plan period, it is proposed to extend the investigations to the biosynthesis of food flavours and the mode of sensory perception of these flavours. It is expected that the elucidation of the bio-genesis of food flavours occurring in spices and natural foods and the mode of their sensory action would lead to the application of enzymic agencies involved in these processes to generate new or modified flavours from concentrates derived from natural sources and also produce flavours in the form they occur finally in the prepared foods. This would be particularly useful in imparting proper and sufficient flavour to processed foods which need minimal culinary treatment and make them as acceptable as the naturally spiced foods.

(c) Present status of research:

There is little information on these aspects of food flavours now. The results of the studies carried out during the V plan and the developments in this and related areas would provide the take-off point, for, the project details of which will have to be worked out then.

(d) Reasons for undertaking research:

There is complete lack of knowledge on these aspects from the basic angle and their importance in developing proper types of food flavorants for processed food products in the future which will have to have the necessary appetising and other qualities imparted by these flavouring principles.

One can easily foresee that very soon large scale and domestic culinary practices will have to change from the labour and fuel intensive type to those involving minimum cooking of partially or fully processed foods. Such foods may not develop the desirable flavour and other associated qualities adequately unless these are provided as adjuvants of the proper type with flavour profiles resembling as closely as possible, those of flavours finally produced in the prepared foods.

10. (a) Title of the project:

Essential amino acid requirements of adolescent subjects and determination of optimum levels of supplementation of cereal and millet diets with limiting amino acids.

(b) Statement of the problem:

Studies on rats have shown that the amino acid requirements can be determined by addition of graded levels to the diet until the plasma level of the amino acid was equivalent to that of a fasting animal maintained on an optimal diet. The amino acid requirements of rats determined from blood levels agreed closely with values obtained using growth as the criterion. The essential amino acid requirements of adolescent subjects aged about 12-18 years will be determined from blood amino acid levels. The optimum levels of limiting amino acids needed to supplement various cereal and millet diets will also be determined from the analysis of the amino acid levels in the blood.

(c) Present status of research:

The minimum amino acid requirements in older children, adult men and women have been determined using the metabolic nitrogen balance

technique. Studies on the relationship between concentration of free amino acids in blood and dietary amino acid intake have shown that plasma amino acid levels may be used for estimating accurately the amino acid needs or for determining the optimum level of supplementation of diets.

(d) Reasons for undertaking research:

No data is available in the literature on the amino acid needs at the adolescent stage during which the nutritional demands are high. Determination of the optimal level of supplementation of Indian diets with the limiting amino acids will be necessary, when programmes are set up for supplementing diets with amino acids.

11. (a) Title of the project:

Transportation studies of some commercial fruits with or without treatment under mild refrigeration for internal trade.

(b) Statement of the problem:

Fruits and vegetables are highly perishable at tropical temperatures and their storage life is reduced when exposed to varying high temperature during transport. For instance apples exposed to tropical heat for one day lose seven days of its good storage life at optimum low temperature. Similarly bananas (green and unripe) exposed to tropical temperatures over a period of 74 hours would cause rapid ripening changes in them and become unmarketable at the time they reach their destination. Litchis also face similar deterioration when exposed to tropical temperatures during their transportation to distant places, if transported without adequate refrigeration. In order to find an economical method by which these fruits would reach the distant markets in as near the fresh condition, it is necessary to transport them under mild refrigerated conditions (65-68°F) with or without treatments. This can be easily achieved if the truck or the wagon is fitted with cheaper models of air conditioned units.

(c) Present status of research:

In India, refrigerated vans for transportation of milk and fish were introduced in 1955. In view of the interest shown by the Ministry of Railways in the refrigeration of surplus air conditioned coaches for the transportation of perishables particularly fruits and vegetables, studies were carried out to assess the performance of the cooling system and collect other relevant data. The experiments carried out by transporting betel leaves, mangoes, bananas etc. in air conditioned (60-65°F) coaches to distant markets indicated possibility of such a method, however, the experiments were not conclusive enough to recommend to the internal trade for adoption. Very little information is available in relation to the storage behaviour of oranges, litchies etc. during transport at mild refrigerated temperature (65-70°F).

(d) Reasons for undertaking research:

The production of fruits and vegetables, which is estimated to be around 20 million tonnes is likely to increase by another 20 per cent. In this event, it is quite probable that some of the established markets in urban areas will be flooded with large quantities of fruits per day. This will cause glut in the market with subsequent fall in their prices. Besides fruits which have travelled a long distance at tropical temperatures should have faster rate of deterioration as a result of which the commodity would have to be sold at distress price. In order to avoid such rapid changes in the fruit leading to deterioration from the stand point of marketing it is necessary to transport these commercial fruits after suitable treatments under mild refrigeration (65-68°F) over a long distance. This method can assure the trade of receiving the commodity in fairly good marketable condition which would avoid selling at distress price.

12. (a) Title of the project:

Freezing preservation of tropical fruits.

(b) Statement of the problem:

Frozen foods have become very popular among masses in technologically advanced countries compared to any other methods of preservation known

so far, since this process retains the food qualities as near the fresh condition as possible with minimum wastage for longer periods. However, this development is confined only to fruits and vegetables of temperate origin, and very little is known about freezing preservation of tropical fruits and its products. The delicate flavour is lost and foreign flavour and odour are developed in tropical fruit products when these are subjected to heat processing. Freezing preservation on the other hand, can retain the natural flavour and odour, characteristics of the produce in addition to wholesomeness from the nutritional point of view.

(c) Present status of research:

Refrigeration industry has expanded manifold in the last decade from 59,000 tonnes storage capacity to over one million tonnes in commercial stores and this industry is proposed to increase further in the next 10 years and speedier transport and storage of frozen foods are also envisaged.

Frozen food industry has made a phenomenal growth in USA, UK, USSR, Japan and Australia in the last decade due to the pioneering research of frozen food manufacturers, container manufacturers, State and Federal Government agencies. About 12,568 million pounds of foods worth 6,244 million dollars are frozen and sold every year in the United States alone in view of its popularity than any other type of processed foods. Out of the 42,404 tonnes of processed fruits and vegetables produced in our country, 170 tonnes valued at 1.4 million rupees are frozen (1969). With the rapid development of refrigeration industry and cryogenic freezing, frozen foods are bound to progress to an economic level in the near future.

(d) Reasons for undertaking research:

Freezing preservation is the best form of food preservation known so far, since this process retains the natural flavour, taste, and consumer appeal with minimum losses of essential nutrients. The future growth of frozen foods will depend upon a number of economic and technological factors. Among these may be mentioned factors like increase in population, growth in personal incomes, relation of frozen versus other forms of foods, changes in food tastes and

preferences, consumer acceptance of new products and substitute or synthetic foods. Trends to some extent in our country show a steady progress in the frozen food industry. This may be taken as a guide to the future development and its impact on consumption of frozen foods in the years to come.

13. (a) Title of the project:

Disinfestation of dry fruits by gamma irradiation.

(b) Statement of the problem:

Dry fruits like walnut and cashewnut have good export market. About 11,800 to 13,800 tonnes of walnuts are produced in India of which about 5306 tonnes were exported in 1968-69 to countries like Australia, Canada, West Germany, USA and UK. India produces 70,000 tonnes to 75,000 tonnes of cashew nuts, about 24,00,000 cases per year are exported and Indian consumption is 1,50,000 cases per year. These dry fruits suffer heavy losses due to insect infestation during storage. For the longer storage life and good quality kernels there is a need to control insect attack. This could be achieved by the application of gamma irradiation.

(c) Present status of research:

It has been found that gamma irradiation controls infestation in grains, dry fruits and stored products. The idea of preserving food with atomic radiation has met a suspicious even hostile reception in many quarters particularly within the United States. But for certain foods and food products irradiation offers unique advantages and already irradiated foods are sold in several countries. In Britain, there are shortly to be two applications for exemption from the current ban. A new international project in the field of food irradiation supported by organizations in 20 countries was established on 1st January 1971 (International Atomic Energy Agency) and ENCA (European Nuclear Energy Agency) concerning testing the wholesomeness of selected food products treated by irradiation.

(d) Reasons for undertaking research:

To extend the storage life of walnut and cashewnut kernels for internal trade and export it

becomes necessary to cut down the wastage due to infestation which occurs during storage without affecting the quality of the product.

14. (a) Title of the Project:

Use of ionising radiations in the preservation of fresh fruits and vegetables with regard to suitability, storage of maturity, variety, season of harvest, storage conditions, effect of combination treatments, dose requirements and dosimetry.

(b) Statement of the problem:

Ionising radiations have immense potentialities in regulating ripening and controlling post-harvest losses. However, there are many controversial aspects as to the dose requirements to bring about a certain desired effect. For instance, in mangoes grown in USA the dose required to bring about delayed ripening is about 100-200 krads whereas the Indian varieties tested showed a dose requirements of 25 krads. Similar situation exists with banana also. There are many aspects like maturity of fruits at harvest, varietal trials, season of harvest, storage conditions and the effect of combination treatments will have to be studied in great detail in order to understand the mechanism of action of the ionising energy in regulating ripening, extension of storage life and control of microbial spoilage.

(c) Present status of research:

Research on the above aspects is being conducted all over the world on different commodities. In USA the following fruits such as apple, grape, lemon, orange, peach, tomato, tangerine, raspberry, and strawberry have been tested. Elsewhere Banana, mango, avocado, papaya sapota, litchi, mushroom, bamboo shoots, onion and potatoes have also been examined with varying degree of consistency with regard to results. Not all the commodities tested have responded favourably to ionising radiations. For example, tomatoes and avocados have been completely ruled out in respect of use of radiation. The results of research on other commodities according to the published information. The application gradation will be confined to a limited number of

species and varieties. More specifically it may, in some cases, be limited to certain physiological stages. These aspects required careful attention and much more research work have to be undertaken.

(d) Reasons for undertaking research:

International Atomic Energy Agency (IAEA), FAO-DAE, are putting up international projects spread over the world in the next ten years starting from 1972. Nearly 400 million dollars are set apart for these studies. Finance is a limiting factor in these investigations and since the same is being provided by the above said agency it is bound to solve some of the controversial problems. Therefore, it is felt that with some commodities ionising radiation may prove to be a beneficial supplement to conventional cold storage handling, shipping and marketing procedures.

15. (a) Title of the Project:

Cultivation of mushrooms and its processing for external trade.

(b) Statement of the problem:

In all the Western countries there is a great demand for edible mushrooms and they are considered as an important item of their diet. Due to the extreme climatic conditions existing in the various parts of our country, there is a great possibility to grow different types of mushrooms. No systematic work has been done on the dehydration, accelerated freeze drying and canning of various types of mushrooms available in India. Also no work has been done on the canning and dehydration of edible mushroom mycelium. Export of such dehydrated and canned products may fetch reasonable amount of foreign exchange to our country.

(c) Present status of research:

Cultivation of Agaricus bisporus and Volvariella diplasia is going on in different parts of our country at present. Excellent dehydrated products can be prepared out of these mushrooms. Little work has been done on the canning and dehydration of the fruit bodies of Pleurotus flabellatus and its mycelium.

(d) Reasons for undertaking research:

In the IV and V Plans two projects have been put up on large cultivation and submerged propagation of Pleurotus flabellatus and also on processing of this mushroom. These mushrooms and mycellium can be processed by canning and dehydration. Prepackaging of the dehydrated product using various types of flexible packets, their storage studies and consumer acceptability trials can be taken up in the VI plan for the export of mushrooms.

16. (a) Title of the Project:

Production and testing of lining compounds and lacquers for metal containers in the food industry.

(b) Statement of the problem:

By the end of the 5th five year plan the need for metal containers is likely to increase 2 or 3 fold in spite of alternative metal containers or flexible packages. Lining compounds for sealing purposes and compound for lacquering will be vital requirement. At present they are imported and steps have therefore to be of the order of 16 tonnes roughly based on the requirement per can. This will amount to many more tonnes if the requirement of foods other than fruits and vegetables and non-food cans are considered.

(c) Present status of research:

Two types of lining compounds were suggested by NCL, Poona, but these were not being produced on a large scale. The composition of these may be changed and many new formulations have to be made. The need for specific lacquers for specific products is being felt and work on composition of lacquers is an important field which has to be continued. These studies will be undertaken in collaboration with NCL, Poona and IRL, Hyderabad.

(d) Reasons for undertaking the research:

Lining compounds and lacquers for cans are at present imported. The need for these will be increased by the sixth plan as many new products will be developed. The inner coatings

of the containers are determined by the type of product to be packed. Hence the necessity arises for undertaking experimental work to evolve compositions for preparing these. This Institute will do the testing work to determine the usefulness of the compositions developed.

17. (a) Title of the project:

Development and testing of suitable plastic containers for processed foods.

(b) Statement of the problem:

The need to develop alternative containers instead of the tin containers is being felt as we are importing all the plates so far. This can be used both for bulk storage and unit packages. During the next few years, there is likely to be a worldwide shortage of tin plate.

(c) Present status of research:

So far no systematic work has been taken up in this regard. During the V Five Year Plan this problem will be initiated and depending on the results obtained therein, investigations would be undertaken during the 6th plan.

(d) Reasons for undertaking research:

During the V Plan a project has been put up to initiate studies on flexible containers including laminates. These results would be very useful for the processing industry and will facilitate the marketing of these products packed in these containers and would help in reducing the requirement for metal containers.

18. (a) Title of the Project:

Quality control techniques for newer products being developed.

(b) Statement of the problem:

In the course of the work on the improvement of quality of processed fruit and vegetable products manufactured in the country, the need has arisen to evolve specifications for the new products as also to improve the existing methods of analysis.

(c) Present status of research:

In recent years food additives have been increasingly used to preserve or improve the quality and acceptability of fruit and vegetable products. Thus there arises the necessity for a continued awareness to set up improved analytical methods.

(d) Reasons for undertaking research:

At present there are no reliable method for estimation of fruit juice content, various preservatives, thickening agents etc. which are being used during the development of newer products. This problem assumes greater importance with the innovation of new and improved technological processes.

19. (a) Title of the project:

The thermal process evaluation of canned fruits and vegetables.

(c) Present status of research:

No systematic work has so far been done to evaluate the correct process necessary for each product. Limited work done of late on process evaluation of canned mango products and canned guava using inactivation of peroxidase enzyme system as an index of adequate processing has given good results. The process time required was found to be far less than the commercial practice. The inoculated pack studies have also been done to confirm these values.

(d) Reasons for undertaking research:

India produces about 10,000 tonnes of canned fruits and vegetables valued at 25 million rupees. In the year 1969-70 nearly 8,000 tonnes of mango products alone valued at 1.6 crores of rupees were exported. It is known that in the process of canning indigenous fruits and vegetables the thermal process given is only empirical and many a time they are overprocessed and thus adversely affect the quality of the final product in terms of colour, flavour and texture. This is specially so in the case of canned mangoes and canned orange segments. Correct process evaluation will result not only in the improvement of the nutritional and organoleptic qualities of the product but also in the saving

of fuel consumption and increased turn over. Some of the data collected will also be useful in the design and fabrication of a pasteuriser for viscous food materials like fruit pulps. Attempts will also be made to procure hydrostatic steriliser and work out the processing schedule for indigenous canned products using this latest steriliser.

20. (a) Title of the project:

Studies on pickle manufacture with machinery of suitable design for automation.

(b) Statement of the problem:

The present practice of unhygienic and uneconomic methods of peeling, cutting, dicing, brine curing, mixing etc. are to be replaced when the industrial development takes place on this aspect of pickle manufacture. It is essential to replace the traditional processing methods using improved scientific and technological techniques as the demand for the processed products is constantly increasing.

(c) Present status of research:

At present the raw material suitability for processing of commercial scale is extensively studied with regard to mango. It is also planned to utilise several vegetables which are available during the season for processing them into pickles and chutneys in order to enhance their storage qualities with reference to their texture, colour and flavour.

(d) Reasons for undertaking research:

At present only 0.5% of the total fruit and vegetable produce is being processed. There is a very good scope for marketing these traditional products internally and for external markets. With urbanisation there is already tendency to purchase these readily available products than resorting to time consuming traditional methods. There is a demand both for civilian and military use. A potential market is also developing for consumption abroad.

In view of all these developments it is essential to produce quality products on a semi-automatic production line.

21. (a) Title of the project:

Production of fruit juice concentrate and fruit juice powders using latest techniques

(c) Present status of research:

Some work has already been done in the production of fruit juice concentrates using a batch type forced circulation evaporator. It is not a single pass evaporator but involves recirculation of the juice which will ultimately affect the colour and flavour of the product although most of the nutritional qualities of the juice are retained. The quality aspect therefore needs to be much improved by adopting latest techniques or evaporators. Similarly some work has been done to produce fruit juice powders by vacuum shelf drying process and also by foam drying techniques which is the latest method advocated for the manufacture of fruit juice powders. Intensive investigations have to be undertaken to make the process continuous and economically viable for such products.

(d) Reasons for undertaking research:

There is considerable demand for fruit juice concentrates and powders both in the pharmaceutical and food beverage industry. There is also proposal to incorporate fruit juice concentrates and powders in the infant foods and baby food formulation. India is producing some of the best varieties of mango and guava in the World. Fruit juice powders of good quality can be produced by latest techniques and introduced in the international market. It is proposed to take up design and fabrication of a continuous foam drier during the V plan period and optimum conditions will be worked to manufacture different fruit juice powders so as to release the process to the industry.

India produces about 5,00,000 tonnes of mandarin oranges. Out of this 25% is contributed from monsoon crop which has low keeping quality but can be processed into quality concentrate adopting the latest techniques - Reverse osmosis. Reverse osmosis works at room temperature and at elevated atmospheric pressure. It is reported that good quality concentrate could be produced by this technique because there is no severe heat treatment of the juice

as it works at room temperature. The Technical know-how for producing special membrane required in the reverse osmosis process, and fabrication of a workable unit are available in the country in one of the CSIR laboratories (CSMCRI, Bhagnagar).

22. (a) Title of the Project:

Utilization of fruit and vegetable processing wastes.

(b) Statement of the problem:

In the fruit and vegetable processing industries large amounts of processing wastes accumulates, consisting of peels, pulp, seeds, pits, vines, cores, etc. that could be utilised in some manner as useful by-products in the existing industries.

(c) Present status of research:

In recent years considerable advance has been made abroad in the utilisation of wastes, not only to the profit of the processor, but to the farmer as well. Work on the utilization of citrus wastes, in other countries, has resulted in the utilisation of citrus wastes into valuable by-products like essential oil, orange meal, orange molasses, hesperidine methyl chalcone, hesperidine and other chemicals. Preparation of sugar syrup and animal feeds from pineapple waste material is another example. Studies conducted elsewhere on the utilization of fruit and vegetable waste materials like grapes, pineapple, apples, peaches, apricots, tomatoes, potatoes, etc. have resulted in the preparation of very valuable by products. No scientific data is available on the profitable utilisation of wastes from tropical fruits like mangoes, bananas, guava etc.

No systematic studies have so far been made in the country to utilise these waste materials, except preliminary work on the preparation of starch from mango kernel, banana stem, etc.

(d) Reasons for undertaking research:

In our country fruits like mangoes, bananas guavas, etc. are processed in large quantities. Based on a production figure of 50,000 tonnes of fruit and vegetable products at present in the country the wastage can easily be calculated to be to the tune of 30 to 40 thousand tonnes.

It is well known that processing industry abroad achieves economy in cost to a considerable extent by utilising the waste materials accruing in the processing. In the light of the fact that the processing cost in our country is high, attempts should be expedited in the waste utilisation, in the interests of securing some economy to the food processors.

Results of the studies can bring in, more utilisation of waste materials, growth of national income, import substitution and creation of new industries.

23. (a) Title of the project:

To stabilise and develop the favourable characteristics of Bannur sheep.

(b) Statement of the problem:

Compared to the average sheep in this area, the Bannur breed has better dressing percentage, meat to bone ratio and quality of mutton. Unless steps are taken to preserve, stabilise and develop this breed, these favourable characteristics would be lost for ever due to the unspecific breeding. Steps should therefore be taken by the Animal Husbandry Department to preserve, stabilise and develop breed.

(c) Present status of research:

Comparative studies have been made of the dressing yield and carcass quality of Bannur lambs of Mysore (known to be a good mutton breed) and the non-Bannur market lambs. In all the criteria studied, Bannur lambs have proved superior to the Non-Bannur market samples. Their carcass yields (53 per cent) compare favourably with those of lambs from advanced countries (48-55 per cent). The meat of Bannur lamb has also been found superior to that of market lamb in tenderness, juiciness and flavour. Attempts

should be made to produce more Bannur lambs through selective breeding, feeding and management to meet the shortage of the country both quantitatively and qualitatively.

(d) Reasons for undertaking research:

Previous work on Bannur sheep carried out in this Discipline and also elsewhere has shown that it is a meat type sheep. Apart from having meat type characteristics as higher proportion of choice cuts, better meat-to-bone ratio, higher dressing percentage and larger area of rib eye muscle, its growth characteristics are also superior. Stabilising and developing these characteristics would not only lead to increase in availability of mutton, which has no religious and sentimental taboos attached, but also has export potential.

24. (a) Title of the project:

Technological problems in canning of Tuna

(b) Statement of the problem:

The problem is related to filling up the vital gap in scientific knowledge.

(c) Present status of research:

At Maldives and Laccadive Islands, considerable amount of Tuna is being canned on commercial scale. Also this fish is now being caught very near the Indian shore. There is vast scope to can this product on a larger commercial scale to earn sizeable foreign exchange.

(d) Reasons for undertaking research:

The following investigations need research:

i) Trace elements: Mercury, Cadmium and lead in fish: Often these fish are reported to carry the above poisonous metallic contamination. This varies from locality to locality depending upon the industrial wastes polluting water. Quantitative determination of these impurities and the maximum limit found to produce health hazards.

ii) Frozen storage of these fish and methods to prevent undesirable changes: These fish weigh from a few kgs. to as much as 50 kg. or more. The freezing time taken is considerable because of its

enormous size. A study to determine these factors is desirable because the canned products sometimes exhibit honey combing & toughening of texture.

iii) Greening of Tuna: Some theories have been put forward in this connection but they are mostly hypothetical. Further studies are necessary to elucidate this point. The factors to be determined will be degree of spoilage, degree of trimethyl amine production and its relation to greening, locality of catch, seasonal variation.

iv) By-product utilisation: During canning, the by-products, obtained are red meat and the trimmings of white muscle. These could be utilised as poultry feed or for the manufacture of fish pastes.

25. (a) Title of the Project:

Processing and utilisation of cheap and abundant varieties of fish of commercial value, i.e. trash type.

(b) Statement of the problem:

A fair percentage of the fish catch is small sized fish such as white sardines, silver bellies, penaeid shrimp etc. which at present are not being utilised. During the last few years, considerable work has been carried out at this Institute for their utilisation as FPC.

(d) Reasons for undertaking research:

Economic return and wastage utilisation: About 70% of the Traylor catch constitutes trash fish and only the balance 30% is made up of shrimp and other quality of fish. It is estimated that about 70,000 tonnes of trash fish are being landed yearly. The most profitable utilisation of trash fish is therefore very vital problem. The quantity of trash fish landed may go up enormously before the end of the Fourth Plan where another 5,000 small mechanised boats and 300 big boats are likely to be commissioned.

Further, since in our country there is considerable deficiency of protein, these surplus fish will go a long way in relieving the malnutrition.

Approach:

1. Large scale production of FPC: Economics and marketability aspects have to be taken into consideration.

2. Mechanising the processing of fish crackers using Cassava and fish/shrimp; so that the final product contains about 5-20% protein.

3. Technological aspects of fish sauce: These fish could be profitably utilised for the preparation of fish sauces. Factors to be studied will be: suitability of the above fish for the purpose; hastening of enzymatic action so that the process of digestion is completed within a few months instead of keeping it for longer duration, i.e. 1-2 years as is the traditional practice in South East Asian countries.

4. Comminuted products: To find suitability of these varieties of fish for the processing of fish sausages, proper extensibility and resistance in the product is necessary and the various proteins of fish behave in altogether different manner.

Also to determine feasibility of these fish for processing products similar to Chikuwa (a baked preparation of fish, starch material in different shapes and size).

26. (a) Title of the project:

Boiling and smoking as a means of effective utilisation and preservation of fish.

(b) Statement of the problem:

Mackerel and sardine constitute about 30% of the total catch of marine fish. These fish are considered as delicacy. Unfortunately, a fair percentage of these does not find proper use because of lack of cold storage and transportation facilities. These fish could be either boiled or smoked for their efficient utilisation and preservation. By adopting this approach the fish could be preserved for longer time without icing and refrigeration.

These processed products will find immediate market as they are very tasty. There is also likelihood of exporting these to places like Ceylon, Burma, etc. where there is demand for smoked and dried products.

27. (a) Title of the Project:

Processing and utilization of wastes from fish processing industry; its utilization as poultry feed.

(b) Statement of the problem:

At present frozen shrimp is exported to the tune of about 27 crores of rupees. 40% of the original material forms as Offal. The shells and heads are usually thrown away and many a times they create nuisance. It is estimated that about 800 tons of dried material with about 40% protein could be procured from shells and heads. Apart from the waste from shrimp freezing plants, there are considerable quantities of Offal from fish curing yards and fish canning factories. The meal processed from this waste could be included in poultry ration to replace a portion of cereals.

Also about 70% of the trawler catch constitute trash fish. It is estimated that about 70,000 tonnes of trash fish are being landed.

This study will also entail work on setting up model units on small scale basis for processing and utilisation of fishery wastes in the vicinity of the fish processing factories.

28. (a) Title of the project:

Improvement in system of storage, transportation and marketing of fresh water fish in India.

(b) Statement of the problem:

India is world's second largest producer of inland fish. There has been a 50% increase in production during the last decade (from 309,000 tons in 1958 to 450,000 tons in 1968). Still the organised traditional industry of fresh water fish and fish seed production has utilised only a fraction of the resources. The outlay for seed production in the Fourth Plan is Rs 354 46 lakhs as against Rs 159 45 lakhs in the Third Plan. This assures increased production in the years to come.

Almost the entire production is marketed fish, necessitating long distance transportation. Indian railways alone carry as much as 50,000 tons fish annually, of which 80% belong to fresh water varieties. The trend in fish utilisation in the country (from 44% in 1958 to 67% in 1968) indicate further increase in transportation in future.

(c) Present status of research:

There has not been any change in the traditional methods of packaging and transportation. Our survey has revealed that inadequacy of handling practices results in 25-50% of fish undergoing spoilage during transit. In Calcutta alone, daily loss to the industry is estimated to be Rs 25,000/-. Further, a thorough literature survey showed that much scientific data is yet to be collected on fresh water fish spoilage, to effect any improvement

(d) Reasons for undertaking research:

i) A thorough study of the biochemistry of fresh water fish spoilage including changes in flavour components; (ii) Bacteriology of fresh water fish and their habitat; (iii) Development of reliable indices of quality; (iv) A streamlined system of marketing covering such aspects as collection, packaging, transportation and distribution.

29. (a) Title of the project:

Improvement of quality and flavour in canned and frozen fish.

(b) Statement of the problem:

Canning and freezing form the basis for modern fish processing industry in India because of the world-wide export markets for shrimp. Earning from frozen prawns alone constituted Rs 24 crores in 1970 (from 22,000 tons) with a ten-fold increase from Rs 2.1 crores in 1963. Value of canned prawns exported (2,600 tons) recorded a five fold increase in the same period. Research on shrimp processing is of great importance not merely from their export value - India is now one of the major shrimp producers of the world, but from their higher consumer appeal even for local markets. Long term studies will therefore be

needed on several aspects of the shrimp processing industry, some of which are common to both freezing and canning as follows: (i) preserving the freshness and flavour in the collection and storage of raw material; (ii) methods of dressing during the initial storage period; (iii) processing conditions such as blanching and heat processing, (iv) prevention of blackening, curd formation (in cans) and loss of texture (v) prevention of blackening and losses of flavour components like nucleotides during canning and freezing, (vi) studies on the enzyme systems involved in flavour developments and deterioration and (vii) improvement of flavour by specific flavour precursors as also flavour extracts.

(c) Present status of research:

Although existing work is directed to items (i) and (iv), flavour research covered by (v) to (vii) have to be taken up in future studies. There is some evidence that existing methods of fish canning are rather drastic. Loss of flavour components is also shown to occur in ice storage of shrimp prior to freezing.

(d) Reasons for undertaking research:

In addition to the need for critical studies on shrimp on the above lines, it will be necessary to undertake systematic studies on other marine invertebrate seafoods like lobster, crab, mussel and clams. Turtle meat which is now exported in dried condition is also a delicacy on which advice of this institute has already been sought. Along with the present studies on shrimp increasing attention will have to be paid in future on the canning of fish like seer, pomphrets and tuna. Tuna catches are increasing at a remarkable rate in Indian Ocean which require adequate techniques in the coming years. Samples from recently started Tuna canning plant at Minicoy revealed the need for improvement in quality.

30. (a) Title of the project:

By-product utilisation from fishery waste.

(b) Statement of the problem:

Although as much as 1,25,000 tonnes of oil sardine, a highly fatty fish, is landed annually in India, by-product utilisation has gained practical significance in recent years with the development of the poultry and animal husbandry which require fish meal as a component in animal feed. Complaints have already been raised that fish meal supplied available are not of uniform quality. With the commencement of pilot plant studies at Mangalore Experiment Station, systematic studies on the economics of good quality fish meal production will become possible in the coming years. Fish oil utilisation has a close relationship with fish meal since their common low quality in traditional methods has prevented the optimum use of sardine oil. For fish meal production several varieties of jew fish and red snapper caught by trawlers as also trash fish will be useful raw material. Once good quality sardine oil is available from modern fish meal plants, uses for the oil will be worked out in leather, food and printing industries besides by-products from fish oil like detergents, insecticides and oye floatation agents. In addition to fish meal, it is necessary to investigate the possibility of using shrimp shell waste in poultry feeding as reported in South Africa. Abundant quantities of shrimp shell waste accumulates in Cochin for which uses will have to be worked out as for instance production of chitin (cellulose substitute), chitosan (textile industry) or even cholesterol.

(c) Present status of research:

By products utilisation is practically non-existent in India except unified production of fish meal and crude oil mostly by primitive methods.

Along with fish meal and oil, there is a small export trade in shark fins and fish maws of the value of Rs 60 lakhs annually. Improvements in quality is needed in case of these traditional methods for which suitable standards have to be laid down. There has been interest, of late, in cuttle fish bone about which little work has so far been done in India. Medicinal chemicals, amino acids and enzymes have been prepared in other countries from fishery wastes and some work on such possibilities will have to be explored in the coming years.

Work on fish hydrolysates, silages, sauces and pastes will have to be intensified in the next two decades out of surplus fish or fishery wastes.

31. (a) Title of the project:

Modernisation of the salted and dried fish industry

(b) Statement of the problem:

Even after the advent of the modern fish processing industries like canning or freezing, salting and drying constitutes the largest single industry for fish preservation accounting for 20% of the marine catch, i.e. 20-25,000 tonnes. It also needs attention on two more grounds namely its being the most backward segment of the fish processing industry and its being the source of the cheapest products catering to the poorer sections of the community. In fact, good quality salted and dried fish is considered as the easiest way to improve the protein content of the diets in South East Asia. Notwithstanding the efforts made in the last 10 years, several problems of research and development will have to receive attention in the coming years for modernising this industry. Further problems for R&D may be stated as follows: (i) design and erection of hygienic curing yards and efficient drying sheds; (ii) prevention of insect infestation by fumigation and other methods (iii) use of preservatives and antioxidants for control of mold growth, Halophiles and rancidity (iv) methods of packaging for salted and dried fish and (v) cold storage (60°F) reported to be economical in Malayasia.

(c) Present status of research:

Fish curing yards of the State Governments have not been renovated and improved so far. Use of preservatives and modern packaging have also not been taken up so far in spite of the research already completed in the subject. Insect infestation of fish has not been studied so far in spite of its importance.

(d) Reasons for undertaking research:

In addition to the above improvements, it would be also necessary to explore the possibilities of adopting artificial dehydration, on lines worked out at CFTRI, for obtaining uniform

and good quality cured products. A combination of artificial and sun-drying is also a subject for investigation. Besides, the salted and dried products, work on wet-salted and pit-cured fish may offer possibilities.

In addition to the above traditional methods, research on the production of pickled and marinated products especially from prawns will have to be undertaken because of a good demand in Middle East countries. Pickled fish have the longest storage life and form the useful technique for meeting the local gluts.

Although exports of salted and dried fish are of less importance as compared to prawns, they yielded Rs 2 crores in 1970 and potential markets exist in African countries, some of which are now depending on supplies from Europe.

32. (a) Title of the project:

Studies on the processing and preservation of rabbit and duck meat to augment meat production in the country.

(b) Statement of the problem:

The total meat production in the country today from various sources is around 623 thousand tons per year and the per capita animal protein consumption is only 6.1 gm per head per day, which is far below the recommended level. Further, with the change in feeding habit of the common mass who are slowly crossing in favour of the non-vegetarian foods the demand for meat and meat products is gaining momentum. Hence to bridge the gap between demand and supply we should try to explore all sources of meat supply that are acceptable to human beings. Rabbit meat is widely used in different parts of the world and are quite acceptable in this country. Further, the meat production of the local breeds could be conventionally improved genetically by crossing them with improved meat breeds of rabbits. Parallel with this, suitable processing techniques should also be standardised and kept ready for the industrialists who want to take up the business.

Since rabbits could breed much faster than other meat animals, utilise a good quantity of fiber (around 20 per cent), reach marketable age of 4 to 6 lbs by 8 to 9 weeks (medium size breeds) and could be conveniently processed, canned and preserved otherwise, the opportunities for expanding this section of livestock population for augmenting the meat production is worth attempting. Besides this the fur and skin of rabbits are of great commercial importance, both inside the country and abroad.

Similarly the duck population in the country is also increasing. At present, the population figures stand at 9% of the total poultry population. Many farmers of the country are getting slowly interested in the above business since housing and management of ducks are quite easy and they lay 30 to 40 eggs more than hens per year which in turn also weighs more by 14 to 21 gms in comparison to hen eggs (the nutritive quality of both the type of eggs being almost equal). Further, duck meat is well accepted in the country especially in the Southern and Eastern sectors. Hence their processing and presentation should be taken up soon to get ready before the poultry processing plants shift over to duck processing in addition to their chicken processing.

(c) Present status of research:

Hardly there is any work going on in the country about processing of rabbit meat. Initial studies carried out at CFTRI has revealed that the feed conversion ratio and nutritive value of rabbit meat is quite comparable to other varieties of meat. However, further work is necessary to improve the rabbit population for production of more meat and standardise procedures for their processing and preservation.

Regarding utilisation and processing of duck meat the problem is of very recent origin and very little work has been done in this area as well as on the preservation aspects including curing.

(d) Reasons for undertaking research:

Development of these two sectors will open up two new avenues of livestock industry which not only would increase the employment potentialities but also augment the production of good quality animal protein foods of the country.

33. (a) Title of the project:

Gaseous disinfection and disinfestation of foodstuffs.

(c) Present status of research:

The researches carried out at the Institute during the last 18 years have resulted in the development of indigenous techniques and processes such as Durofume Process for large scale storage in warehouses and Minifume for storage of food grains in home-scale, insecticidal and rodent repellent formulations. The technological aspects of fumigation have been neglected in the country and elsewhere. The behaviour of fumigants (gaseous chemicals) in temperate climates is quite different from that of the traditional modes and storage structures vary enormously from countries like USA, Canada, or Great Britain where work on fumigants have been carried out. Practical methods for large scale handling of fumigant compositions, development of protective kits and assessment of the suitability of the fumigants with indigenous production in the country have been completed during previous plans by the CPTRI.

(d) Reasons for undertaking research work:

Considerable effort is now needed for the exportable commodities like the spices, walnut, coffee, groundnut, break-fast foods, instant foods, macaroni products, dehydrated products, packaged and processed enriched foods which require suitable disinfestation treatments prior to export to other countries or storage for internal consumption. Each commodity due to its special characteristics needs a suitable fumigant which could be selected after fundamental and applied studies on different aspects such as biological efficacy, non reactivity with food components, safety of the residues and economic feasibility. This line of work is having enormous scope in future also to extend to other areas such as gaseous sterilisation of equipment, utensils, hospitals, pharmaceutical products and appliances and over all environmental sanitation. Long term researches on the fundamental and applied aspects of gaseous disinfestation and disinfection have a tremendous future for securing export market with high quality and sanitation standards.

34. (a) Title of the project:

Minimising pesticides pollution and monitoring pesticide residues in foods, water, air and environment

(c) Present status of research:

Enormous quantities of pesticides belonging to chlorinated, phosphatic and organomercury compounds are being used in the country. More than 40,000 tonnes of different insecticides are being applied in the field of agriculture, food storage, in residential buildings and industrial installations. On the basis of the toxicological data, average safe limit of these pesticides may be calculated at 0.2 ppm in food products. The magnitude of the hazards of using 40,000 tonnes of insecticides in Indian environment as against pesticide safety limit for the consumers of about 0.2 ppm as residues on foods can easily be appreciated. Until new safer pesticides are developed, application of the present insecticidal compounds will continue to maintain the food production, health and nutrition of the people.

(d) Reasons for undertaking research:

Since the residues of the persistent types of pesticides are to be maintained within the low threshold levels in the long run, monitoring of all the pesticides residues and their metabolites in raw and processed foods together with the prepared food to determine the average intake of pesticide by Indians must be taken up as a long-term programme for safety.

35 (a) Title of the project:

Development of selective and specific pesticides and nutritional food protectants.

(c) Present status of research:

The widespread use of persistent wide spectrum pesticides on food crops in food processing plants, residential buildings and storage, warehouses has created many new problems with regard to the protection of public health from chronic toxicity hazards of inadvertant exposures. Human fat and animal tissues have been found to contain DDT, DDA,

DDE, BEC, Dieldrin etc., even in India. Extreme exacting conditions are needed for safe application of these chemical poisons on food crops and grains which cannot be easily realised on a national scale of application.

(d) Reasons for undertaking research:

In the habitats of man such as food storage, food processing plants, industrial establishments and residential buildings the utility of developing safe agents which have specific actions on pests for the control of infestations in food crops, stored grains and their products and human dwellings cannot be over emphasised. There are many promising lines on which the investigations are bound to yield profitable results which have not yet been exploited in India or elsewhere. Investigations at the CFTRI have resulted in the development of selective and safe products like meta-hydrogen halloysite from kaolin as protectant for some stored grains and seeds. Tricalcium phosphate with vitamin and glucose, a nutritional food additive formulation has also been found to be inhibitory to the growth and development of stored products insects in processed foods. Low mammalian toxicity pesticide within its permissible limits and bacterial insecticide have been developed for integrated application of chemical and biological control for minimising the hazards of residual pesticides to human health and wildlife.

36. (a) Title of the project:

Aseptic storage, microecological control and environmental manipulation for long term storage of grain in bulk.

(c) Present status of research:

Storage in bulk and packaging in small unitized containers can provide micro and macro climates for preservation of food grains and their processed products. During the third, fourth and fifth five year plan periods the institute has been carrying out systematic investigations of fundamental and applied aspects of bulk storage, influence of temperature changes, initial moisture contents, influence of material for construction of structure, biochemical changes and fungal activity in grains, effect of some volatile

chemicals on the deteriorative changes, toxicological aspects of deteriorated grains, mycotoxins, effect of desiccants, drying etc. The results of these studies have opened up new approach to the problem of storage and preservation of moist grain and also dry grain in metallic structures. Dehydro bin and unitised clay bin for the rural storage have been developed on the basis of fundamental studies on the above lines. Flexible airtight storage structure (balconing technique) has been developed for large scale storage of coffee and other moisture sensitive commodities. This ballooning technique is moisture-proof, insect-proof and rodent-proof.

(d) Reasons for undertaking research:

With the emphasis on storage of grains and their products in the context of green revolution hermetic and aseptic storage have great future application in the a sence of structures and installations like the silos and other storage plants. Under the tropical climatic condition bulk storage in silos presents many problems due to moisture migration and effects of diurnal and seasonal temperature fluctuations. The frequent handling, turning, moisture and equilibrium, drying and other operational requirements for bulk storage and grain in silos are responsible for making silo storage to be extremely costly. Therefore, there is a need to reduce the cost of bulk storage under tropical conditions with the application of aseptic storage, microecological control and environment manipulation to obtain long term static storage in situ. Promising results have already been obtained in the field of gaseous sterilisation, improvement of the indigenous storage structure and understanding of inherent properties of grain in bulk and small quantities. Sorpitve substances have been developed for use as carriers of gaseous sterilants and which are released only in the event of moisture migration and development of hot-spot in grain bulk. This product and technique can be of great value in underground storage and above ground storage structure in the tropical countries. Integration of these ecological measures with the preharvest prophylaxis can have national application in the long run. The atmospheric, ecological control and hermetic-aseptic storage, singly and in combination are now to be developed for practical application in the country. Long term investigations will have to be taken up in this field.

37. (a) Title of the project:

Physical and biophysical control of infestation in processed foods.

(c) Chemical and microbiological and related aspects of insect control have been investigated in India and elsewhere. But the development of food industries, processed foods, instant products, ready-to-serve foods, breakfast food, dehydrated and desicated foods, ready-to-use products, etc., have posed the problem of developing physical methods of disinfection either at the packaging or pre-packaging stage.

(d) Reasons for undertaking research:

Equipment like entolater and ionising radiators have found some application in this area. No research has been carried out in India on the performance of the equipment like entolater, ultrasonic generator and related equipment in packaging of foods after manufacture. Basic studies are needed on the design of the equipment suitable for utilisation by food industries in India. Researches on long term basis on the development of physical and biophysical methods for disinfection employing impact treatment, high frequency vibration, ionising radiation, ultrasonic waves, infra red and ultra-violet spectra, laser beams are some of the lines which require exploratory studies.

38. (a) Title of the project:

Technology of coffee.

(b) Statement of the problem:

Production of coffee in the country has shown an increase and in 1970 the production was in the order of 1.1 lakh tonnes. Coffee has been one of the foreign exchange earners and about 30,000 to 35,000 tonnes are exported every year. The requirement for internal consumption is also large. With the trend towards an increased production, further avenues for export of coffee are necessary and the Government is anxious to explore new markets in South-East Asian countries. One of the main problems has been the higher cost of our coffee. Ways and means to bring down the cost of production by better utilisation of technology or finding diversified uses for coffee seem to be the main problem that the industry will face besides

maintenance of quality in coffee. There has been some report about lowering of quality and the coffee board is seized of this important problem. With the above background the following problems may have to be tackled.

i) Study of the quality factors in coffee: This becomes essential in view of the fact that various reports have recently come indicating that the quality of the Indian Coffee exported is coming down. The Coffee Board is anxious to go into this problem. The main aspects of this will be to understand exactly in which aspects of quality the Indian coffee is deteriorating, i.e., colour, size, roasting characteristics, aromatic qualities and cup characteristics.

ii) Improvements in processing technology so as to bring down the unit cost of the product.

iii) Efficient utilisation of lower grades of coffee.

iv) To find diversified uses of coffee in combination with other food materials.

v) Improvements in packaging of roasted coffee and various other products.

(c) Present status of research:

The two research institutions which have been concentrating on coffee research are Central Coffee Research Institute under Coffee Board and CFTRI. Since 1952 with the sponsoring of Coffee Board, coffee technological work has been in progress at CFTRI. Problems in storage, moisture control, prevention of quality changes during monsoon, improvements in roasting technology, framing suitable quality specifications based on analytical data were the problems tackled during this period. Close collaboration has been maintained with the Coffee Board Research Station.

(d) Reasons for undertaking research:

Except by appearance and cup test, methods of defining and evaluation of quality are not available. More fundamental knowledge is essential to understand the role of the various constituents in contribution of colour, flavour and strength to coffee. Such a work will contribute to our knowledge about quality and find application in the industry. Better utilisation of the various grades of coffee, creation

of new industries and promotion of exports are some of the advantages which are expected to accrue by undertaking the work on problems suggested.

39. (a) Title of the project:

Technology of Tea

(b) Statement of the problem:

India stands first among the tea producing countries of the World both in respect of its total production as well as its export, as the following data indicates:

World production of tea and export
(in million lbs.)

Tea producing countries	Production		Export	
	1945	1968	1945	1968
1. India	534	886	370	485
2. Ceylon	277	496	229	460
3. China	7	350	15	63
4. Japan	52	187	2	4
5. U.S.S.R.	62	121		
6. Indonesia	51	88		
7. Pakistan	53	63	Insignificant	
8. Argentina	1	36		
9. Middle East	8	96		
10. East Africa	36	180		

Source: Monthly Bulletin of Agricultural Economics & Statistics, FAO, Rome

More than 50% of the produce in India is exported (the balance being consumed within the country) and the export contributes 120-130 crores of rupees in foreign exchange (excluding export duty, excise duty, taxes, etc.) which represents nearly 30% of the total foreign exchange earned from all exportable commodities in India. The industry is not only a major foreign exchange earner but also a highly labour intensive industry. An idea of the extent of foreign exchange earned by the Industry since 1965 may be visualised from the following data.

Tea exports from India and average
auction price realised

Year	Tea exported (Million kgs.)	Auction price (Rs/kg)	Total foreign exchange earned (excluding customs duty, excise duty, taxes etc)
1. 1965	199.4	5.45	108.6
2. 1966	179.2	5.73	102.7
3. 1967	213.7	6.48	138.5
4. 1968	211.4	5.92	125.1
5. 1969	168.7	6.19	104.4

Source: Monthly Bulletin of Agricultural Economics & Statistics, FAO, Rome

With the increasing production of tea in different tea producing countries, there is likely to be a keen competition between exporting countries and investigations have to be carried out to reduce the cost of production, improve the quality of the product and a diversification of the tea products brought about. The cost structure of the technology at all stages of manufacture including packaging has to be looked into.

A second aspect of the problem in technology is the utilisation of the waste and byproducts of the instant tea industry. Since there is a rapid increase in the consumption of instant teas in different countries (especially in USA) at the expense of conventional black teas, it is visualised that by 1980's at least about 10% of the tea produced in India will change over to instants. At this stage one has to prepare for a keen competition from other instant tea producing countries and the cost of production will have to be cut down. One method for such a reduction will be to economically utilise the byproducts and wastes from the instant tea industries. At this period, India will have to dispose of about 35-40 thousand tonnes of spent leaf (dry basis) per annum. This can be processed for the recovery of useful constituents still present in the waste like leaf proteins (to be investigated at CETPI) or tea polyphenolic residues in the spent leaf (may be investigated by the Central Leather Research Institute, Madras) or process it suitably for consumption as animal feeds, as organic fertilisers etc.

(c) Present status of research:

On the cultural aspects of improvement in the tea quality, considerable amount of work is being done in the two Tea Research Stations in North and South India. On the technological aspects, work is being done only in North Indian Tea Research Station where facilities are available for this work. The technological and chemical aspects of tea research for South Indian teas which represent nearly 25% of the total production in India can be carried out at the CFTRI since such facilities are not available in the South Indian Tea Research Station.

Practically no work has been carried out on the utilisation of the wastes and byproducts of the tea industry except for a process developed for the recovery of caffeine from tea waste from black tea manufacture

(d) Reasons for undertaking research:

With the increased production of tea during the next 15 years (growth rate in S India is about 3.4% per annum) improvements are needed in respect of quality, reduction in cost of production and use of cheaper but efficient packaging materials. Also developments in diversification like new techniques of manufacture as developed in USSR. The research has to be undertaken in order to improve the economic returns, defence needs and production of exports to new markets.

40. (a) Title of the project:

Development of spice industry

(b) Statement of the problem:

The target of production and export of spices are given below:

	Target		Export of all spices 1969-70
	1969-70 '000 tonnes	1973-74	
Pepper	25.4	42.0	41,648 tonnes at Rs 3,44,884,000
Ginger	19.2	26.0	
Turmeric	128.0	128.0	
Chillies	390.0	No target	

The problems of the industry are as follows:

1. Varietal variation: The number of varieties of various spices grown at present are too many and it is essential to look into their composition with reference to active principles, yield and other considerations. This means a systematic approach will have to be undertaken to examine the varieties so as to screen out the one which will have the advantages with reference to yield and the desired characteristics with reference to active principles. This work will have to be phased in the course of the five years so that the information will be useful to the plant breeder to think of suitable varieties for the requirements of the industry.

The food processing industry at present would like to have a production with high content of the active principles and extractives so that it will be possible for them to control the quality of the products in which these are added. Partial work on this aspect has been initiated at the Institute but this work should continue with the active collaboration of the various agricultural departments and ICAR.

2. The special requirements in upgrading the quality of the raw ~~xx~~ spices like cleaning devices, air classification, dehuskers, size graders, etc. should be given due priority.

3. Similarly the requirements of the processed spice industry, i.e. curry powder and manufacture of seasoning etc. will have to be gone into with reference to the machinery requirement, grading devices, packing machines, etc.

4. The processed spice products like spice oils and oleoresins will require the following priority attention.

i) production of suitable varieties in sufficient quantities for processing industry.

ii) Establishment of the industry and prescribing quality specifications and also help the industry in the assessment of quality.

The Institute has already worked on processes for the extraction of spice oils and oleoresins and the processes are now being released to the industry.

iii) The possibilities of making the planter also a producer of these products have to be examined so that he will have all the benefits accrue by increased profits going to him instead of the middlemen.

5. The spice oils and extractives are now being blended to produce a standard type of flavour materials for the industry. This aspect of the industry has not received its due importance at present in the country. It is necessary that the required expertise should be built within the country so that the food industry which is coming up fast in the country will be able to get indigenously produced blended flavours for the various food products. Besides, it is also necessary to prepare blends which can be utilised in the big hotel trade which is also developing fast in the country.

6. Steps should be taken to produce suitable varieties as required by the importing countries so that processed products made will be readily acceptable to them.

The above projection will be essential for the spice industry for its technological developments.

(c) Present status of research:

Very little attention has been given to spice research in the IV plan. Commensurate with the magnitude of the industry and the export potential, ICAR has recently started the Central Plantation Crop Institute at Kasargod and has plans to open a separate institute for spices in Calicut. All these years ICAR has been supporting research in a limited way in the various states. With the initiation of All India Coordinated scheme for spices the work on production, breeding, agronomy and physiology is likely to get a boost. Certain aspects of technological work has been in progress at CFTHI mainly on the development of technical know-how for the spice oils and oleoresins. This work is mainly export-oriented. Analytical data on cardamom, ginger, chillies and turmeric has been collected and processing improvements in cardamom and ginger shown to the industry.

(d) Reasons for undertaking research:

For overall development and solution of the various problems enumerated above both fundamental and applied work are essential, so that the industry can be stabilised. During the IV and V five year plans production of spice oleoresins will be undertaken by a few parties utilising the know-how developed by us. The next phase for development of this industry will be to go in for compounded flavours for specific foods. The indigenous development of the food industry during this period will create an internal demand for such products, which have been developed mainly with a view to export. The overall development envisages development of an industry utilising efficiently the raw material, improving employment potential and promotion of exports.

41. (a) Title of the project:

Cocoa

(b) Statement of the problem:

India has been importing 1000 tonnes of cocoa every year. This quantity has been used for local consumption and a small quantity of the value of 50 lakhs rupees has been exported. The growing of cocoa in the country has been encouraged. The area planted in 1964 was about 200 acres and the target has been to achieve self-sufficiency and also to produce some quantity for export. The present area under cocoa is reported to be in the order of 2500 to 3000 acres. The present reports are that cocoa grows well in Kanyakumari District, Wynad, Mysore and Kottayam Districts.

The production in a couple of years will not only meet our internal consumption but also leave a substantial quantity for export. The country will be able to save nearly 40-45 lakhs of rupees by way of foreign exchange by this import substitution.

This industry being a new industry for the country, will require technical help to process and market cocoa beans. Besides, more processing industries for making cocoa and chocolate products will be established as a result of this indigenous production.

The following problems are envisaged:

i) To study the quality of the cocoa produced in the different regions and help the planters in modern methods of processing cocoa fruits to cocoa and its products.

ii) Help to the industry in process know-how for making chocolate products.

iii) Design of suitable machinery for processing cocoa for chocolate and other products.

iv) Help in quality control of raw and finished products.

(c) Present status of research:

The production aspects of cocoa is being tackled by Central Plantation Crops Research Institute, Kasargod and Agricultural Department of the States. Cadbury Fry (India) Pvt. Ltd. has been doing some extension work and have established nurseries for promoting cocoa production. No technical work is being done at present.

(d) Reasons for undertaking research:

This being a new industry in the country will require a lot of technical help in the beginning. Besides creating new industries with employment potential, import substitution is also envisaged. Export potential is also indicated.

42. (a) Title of the project:

Extraction and utilisation of proteins from oilseed meals, legumes and cereals

(b) Statement of the problem:

Foods based on oilseeds, cereals and pulses have been formulated and tested. These have the disadvantages of bulk, undesirable constituents and unwanted flavours. Many of these disadvantages can be eliminated if protein isolates are used instead.

(c) Present status of research:

Methods for the preparation of protein isolates from groundnut and soyabean have been developed. Isolation of protein from other oil-seed meals is in the laboratory stage of development. Upgrading of cereals for production of protein-rich fraction (for weaning foods) has been reported. But the extraction of protein from legumes and cereals where the protein content is limited poses problems which need concentrated work.

(d) Reasons for undertaking research:

It is anticipated that by the VI plan period more sophisticated foods containing purer ingredients like protein isolates will be required. Also textured vegetable protein meat substitutes and milk-like products will find ready market. The programme is aimed at providing protein isolates from various agricultural commodities like oil-seeds, cereals, and legumes for these purposes.

43. (a) Title of the project:

Bulk storage of raw materials under modified environment.

(b) Statement of the problem:

Bulk storage of agricultural raw materials in the season of plenty is a necessity to meet the requirements in the season of scarcity. Fresh fruits and vegetables being seasonal in nature, storage of this raw material in the fresh form either for fresh trade market or for bulk processing is essential. To this effect, storage of fresh produce at low temperature and/or controlled atmosphere have been developed. However, these methods have been of limited value for tropical produce. Storage of these produce under sub-atmospheric pressure and/or controlled illumination at ambient or cooler temperature have been proposed in recent years, especially for tropical produce.

(c) Present status of research:

Possibilities have been shown for storage of tropical fresh produce in sub-atmospheric pressure at ambient temperature for a period of 3-7 weeks (Science, 153, 1966). Improvement of colour and degreening of citrus fruits have been achieved by storage of raw material under controlled illumination. In view of this, coloured flexible packages have been introduced in the

market for fresh fruits and vegetables in USA, England, Australia, and other advanced countries. However, such information on tropical produce is limited.

(d) Reasons for undertaking research:

Storage of fresh fruits and vegetables of tropical origin at ambient temperature under reduced atmospheric pressure is likely to lower the metabolic activity, expel the oxygen and ethylene from the intercellular space, thereby prolonging the storage life or aging process. Exposure of fresh fruits and vegetables under controlled illumination is beneficial for degreening citrus fruits or increase pigments both externally and internally. This will not only improve the consumer appeal but also the vitamin content of commodity. Combination of these two well known principles could be employed on a commercial scale for bulk storage of raw materials at ambient temperature and for consumer packs using the semi-permeable coloured climates for raw materials produced in this zone.

44. Title of the project:

Study of consumer appreciation of qualities, attitudes and requirement to develop product concepts.

45. Title of the project:

Development of semi-processed and processed foods with cryogenic frozen storage capabilities and distribution through refrigerated storage and transport.

46. Title of the project:

To study snack foods, convenience foods, including complete meal ranges for use in homes, school feeding programmes and institutional feeding.

47. Title of the project:

Study of flavour problems of newer varieties of the traditional and new agricultural raw materials that are and will become available during the V and VI plan periods and device newer uses for the same.

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES
(IV & V FIVE YEAR PLANS)

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Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Title:

Project oriented R&D programme: organisation, coordination, evaluation and follow-up of research projects of the Institute

2. Justification:

Research management is an important arm of an R&D institution. CFTRI is a multi-disciplinary technologically oriented R&D centre committed to fulfil the socio-economic needs of the country. There are at present nearly 900 workers, of whom nearly 500 are professional and technical personnel representing sixteen different disciplines of science and technology. The annual outlay is now nearly ten million rupees and 20% increase is planned for each year of the IV and V Five Year Plans. Inter-disciplinary Research and Development Projects are in progress which will be nearly 75 at a time in number having 4 to 6 workers on each project. The resources available in a limited measure have to be allocated to the research and development projects to optimise the returns from R&D. This task is a dynamic management function and involves professional and technical personnel who have the ability to discharge the functions of data collection, analysis and reporting on the progress of R&D to the executive authorities advising the Institute, periodic review of the progress of R&D projects, costing and cost control of R&D, and aiding in the utilisation of results of successful research. The research management structure has to plan and optimise the rate of growth of personnel and expenditure on R&D in implementing the policies stated in the charter of the Institute and those approved by the CSIR.

3. Objectives:

- i) To evolve a built-in system of evaluation of R&D projects in CFTRI
- ii) To optimise the use of resources available in limited measure for R&D

- iii) To maximise the creativity of R&D personnel through a project-oriented R&D programme at CFTRI
- iv) To promote effective utilisation of results of successful research.

4.1 Nature of Activity: Technical

4.2 Classification: Research Management

4.3 Orientation: Research utilisation

5. Period: April, 1972 to March, 1974
(continues during V Plan)

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Title:

Preparation of Library Bulletin, Documentation
List for Food Technology and Bibliographies

2. Justification:

In the field of Food Science and Technology nearly 2000 periodicals are published today. Normally, a research worker cannot read regularly more than 15-20 journals in his field. Due to seepage of articles in various journals, he may miss a fairly large number of papers in his field of research. It is estimated that 40 per cent of specialists' time can be saved, if a good documentation service is provided. It is, therefore, necessary to conserve the specialists' time and energy, through pin-pointed, exhaustive, and expeditious service.

3. Objectives:

Library Bulletin and Documentation List for Food Technology and Bibliographies which are being produced with the following objectives:

- a) To keep abreast of the macro and micro documents that are being received in the Library;
- b) To keep readers abreast of the current researches in the field of food technology;
- c) To help the scientist in making the retrospective search for documents on specific topics in the field of food technology;
- d) To avoid duplication of research.

4.1 Nature of activity: Technical

4.2 Classification: Documentation

4.3 Orientation: Conservation of human
resources

5. Period: Continuous

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Title:

A descriptive English-Kannada Dictionary of scientific terms used in nutrition, food science and technology.

2. Justification:

Science literature is being created with a fast tempo in Kannada. There is a long felt need for the standardisation of scientific and technical terms. The existing reference volume only graze the surface in the fields of nutrition, food science and technology. In scientific terminology each word should have a precise and accurate meaning and should not be loosely used. The Institute has got all types of technical and literative facilities and it will be befitting this Institution to bring out the descriptive dictionary.

3. Objectives:

Standardisation of scientific terminology pertaining to nutrition, food science and technology in Kannada which will be avidly absorbed by the world of Kannada science literature.

4.1 Nature of activity: Scientific

4.2 Classification: Dissemination of information

4.3 Orientation: Public education

5. Period: April, 1974 to March, 1979

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Title:

Development of a National Food Science and Technology Library and Information Centre

2. Justification:

The Institute Library at present has a collection of 23,000 volumes of books and periodicals. It has a floor space of 6000 sq. ft. and accommodates 60 readers.

It is likely that during the Fifth Plan Period, the need for collecting all documents on Food Science & Technology will increase for Institute staff and students as well as various food industries and research organisations in the country.

To store and retrieve all the documents collected a well planned National Library for Food Science and Technology with a floor space of 40,000 sq. ft. with furniture and equipment is necessary.

3. Objectives:

1. To procure and process all publications published in the field of food technology and allied fields
2. Maintenance of a National Library for Food Technology on lines similar to a National Science Library
3. Maintenance of a directory of research and its progress in food technology and related subjects in the country.
4. Coordinating the work of special libraries dealing with food technology and information centres in the country.

4.1 Nature of activity: Developmental

4.2 Classification: Library & Documentation Service

4.3 Orientation: Supporting Research Activity

5. Period: 1974-75 to 1979-79

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Designing Depth Classification for
Sensory Evaluation and other subjects
(Food Marketing, and Market Research).

2. Justification:

Subject specialisation is ever-deepening. The boundaries of the universe of knowledge are everwidening. The situation calls for a library service more comprehensive and effective than the mere provision of reading materials. This service is known as Documentation.

Sensory Evaluation of Food has developed as a subject in the last decade in a big way. Good amount of literature is swelling in this subject. It is, therefore, necessary to design a depth classification to arrange these documents in a filiatory sequence as we have done for Food Technology.

3. Objectives:

Sensory Evaluation Unit of the Institute is adopting different methods such as ranking, scoring, and sequential differences etc. for quality assessment of food products developed by this Institute. They required that all the documents available on this subject may be brought to their notice to improve their research activities. Recently an All India Workshop on Sensory Evaluation which was held at this Institute recommended the compilation of a bibliography on this subject.

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|--------------------------------|---------------------------------|
| 4.1 <u>Nature of activity:</u> | Scientific |
| 4.2 <u>Classification:</u> | Documentation |
| 4.3 <u>Orientation:</u> | Conservation of Human Resources |
| 5. <u>Period:</u> | 1972-73 to 1973-74 |

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Title:

Bringing out regular scientific and technical publications

2. Justification:

Scientific and technical publications form vital part of the functions of the research institution. CFTRI has been regularly publishing Annual Reports and Food Technology Abstracts (Monthly). In addition, Monographs have also been brought out from time to time. These will help in communication of research findings between the research workers; both within and outside the Institute. It will also increase the efficiency of the research worker and avoid wastage of human and material resources from unnecessary duplication of work through the ignorance of the availability of knowledge in ones field of activity.

3. Objectives:

- 1) Publication of Annual Report
- 2) Publication of Food Technology Abstracts
- 3) Publication of Monographs at the rate of one per year.
- 4) Publication of quarterly technical digest.

4.1 Nature of activity: Scientific

4.2 Classification: Scientific Information and Consultancy

4.3 Orientation: Productivity, Conservation, and Utilisation of resources

5. Period: Continuous

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Analysis of samples from food industries for effective Consultancy work - setting up of a laboratory

2. Justification:

Most of the 12,000 manufacturing units engaged in processed food industry have not got laboratory facilities to exercise quality control measures on raw materials and finished products which are so vital for the proper development of food industries. In the absence of a separate laboratory in the Institute for analysis of samples from food industries many a time this type of service is denied to food processors who contact us frequently for such assistance. This type of analysis is also necessary for making consultancy services more effective and for proper development of food industry in the country. It is, therefore, essential to set up a laboratory for analysing samples from the industry on request.

3. Objectives:

i) To analyse, on request, samples of the food industry and thereby render effective consultancy assistance

ii) After the establishment of the laboratory analysis of fruit and vegetable products samples collected under the Fruit Products Order that is now being done in a separate laboratory attached to FVT Discipline will be transferred to this unit.

4.1 Nature of activity: Technical

4.2 Classification: Consultancy

4.3 Orientation: Welfare and overall technological development of the industry

5. Period: The laboratory will be set up within March 1972 - Feb. 1973 and afterwards analysis work will be on a permanent basis

Discipline : Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Survey of Machinery and Equipment requirement of
(i) Fruit and Vegetable Preservation Industry,
(ii) Biscuit and hard-boiled confectionery industry.

2. Justification:

Of late, it has been observed that the processed food manufacturing units - even the small and cottage scale ones numbering nearabout 10,000 in organised sector want to mechanise their operation. New entrepreneurs also want information in respect of machinery and equipments that are required and available in the country to start processed food industries. Adequate information is not available on the subject, it is therefore necessary for proper development of food industry to carry out a survey regarding the machinery and equipment now used by the above industries and the machinery and equipments that are now fabricated in the country. This survey will be the basis for formulating plans to mechanise the above two industries.

3. Objectives:

To find out the extent of mechanisation in these two industries under study including availability to indigenous machinery and equipment and suggest steps to be taken for proper mechanisation, increasing productivity and economic utilisation of materials and machine.

4.1 Nature of activity: Technical.

4.2 Classification: Consultancy.

4.3 Orientation: Assistance in the formulation of plan to mechanise:
i) Fruit and vegetable preservation industry.
ii) Biscuit and Confectionery industry.

5. Period: March 1972 to December 1974.

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Preparation and publication of pamphlets on products and processes developed at the Institute for use by entrepreneurs, industrialists and concerned Government agencies.

2. Justification:

Besides conventional products and processes near about 120 new products and processes are now available from the Institute for Commercial utilisation; we have got short technical and non-technical notes on these but we have not got integrated notes indicating a brief outline of the processes/products, raw materials and machinery and equipment required, economic production capacity, technical and non-technical personnel required, market potential etc. Many industrialists who come to us to take our processes/products want to get such information in order to select processes/products that they can take for industrial utilisation. Complete information in pamphlet forms incorporating the points mentioned above will therefore be quite useful for consultancy work as well as for development of new food industries in the country based on our know-how.

3. Objectives:

To disseminate information on products/processes/techniques developed in the Institute to interested parties in such a way that it should be possible for them to get a clear idea of the processes/products so that they can decide regarding their industrial utilisation and thereby to assist in development of processed food industry in the country.

4.1 Nature of activity:

Scientific.

4.2 Classification:

Consultancy.

4.3 Orientation:

Industrial Development.

5. Period:

March 1972 to Decr. 1973.

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Consultancy Services and Technical Enquiries.

2. Justification:

Rendering of consultancy services and answering of technical enquiries is one of the most effective methods of carrying out results of research to the actual users. Such services which were 1291 in 1965 has now increased to more than 4000. It will go on increasing in years to come. Moreover about 150 representatives of industries visit the Institute annually for discussions on technical aspects of food industries. As the links between CFTRI and Food Industries grow stronger these functions will become more and more important and vital.

3. Objectives:

a) To answer technical enquiries from available information and give advice to food industries, co-operative societies, Government organisations and Universities on matters relating to food science and technology and nutrition.

b) To prepare feasibility and project reports and model schemes.

c) To discuss with the Industrialists who visit the Institute and arrange for analysis of product samples to assess quality and for improvement of the product.

d) To assist in the development of food industries on a sound technological basis.

4.1 Nature of activity: Scientific.

4.2 Classification: Consultancy, Process Research, Product Research.

4.3 Orientation: Industrial development.

5. Period: April 1972 to March 1979.

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Market Research.

2. Justification:

At this Institute research is directed in large measure towards the development or the standardisation of traditional or new products which will meet the needs and preferences of the consumer. Market research is necessary to find out the likes and dislikes of the consumer and to provide this information to the research worker to formulate projects on realistic basis.

3. Objectives:

To undertake habit and attitude surveys, family budget surveys, socio-economic research, product development research and predictive research so that available resources are utilised only towards development of products which have a fair chance of success in the market.

4.1 Nature of activity:

Scientific.

4.2 Classification:

Product development
and survey.

4.3 Orientation:

Market Research.

5. Period:

April 1972 (to continue).

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Assistance to research workers in the design of experiments and statistical analysis of data.

2. Justification:

Proper designs for the experiments and the use of appropriate statistical methods for the analysis of data are essential in the testing of hypothesis and drawing valid inferences. As most of the research workers have no training in statistical methods, it is necessary that assistance to research workers in the design of experiments and statistical analysis is provided till they are trained in the same.

3. Objectives:

To assist the research workers in the design of experiments and statistical analysis of data.

4.1 Nature of activity: Scientific.

4.2 Classification: -

4.3 Orientation: Planning of experiments and interpretation of data.

5. Period: April 1972 (regular activity).

Discipline: Industrial Research,
Consultancy&Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Training of research workers of the Institute in
Design of Experiments and Statistical Methods.

2. Justification:

Most of the research workers in the Institute have no training in Statistics and consequently approach the staff of the Statistics Unit even for elementary designs and calculations. Some research workers who have learnt Statistics need to be refreshed. It is considered that all the research workers in the Institute should acquire at least a working knowledge of statistical methods and design of experiments, so that they plan their experiments on sound statistical lines and carry out the statistical analysis of the data by themselves.

3. Objectives:

To train a few (two) research workers in each Discipline every year in the Statistical methods, so that in the course of 5 years, each Discipline has at least ten workers possessing the requisite knowledge in the application of statistical methods.

4.1 Nature of activity: Scientific.

4.2 Classification:

4.3 Orientation: Planning of experiments
and interpretation of
data.

5. Period: April 1972 to March 1977
(One hour per week).

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES.

1. Project Title:

Press handouts (Publicity and Public education -
English & Hindi).

2. Justification:

Public awareness of the importance and value of scientific research and development has been steadily increasing as seen from press reactions and discussions in the Parliament which have been mostly based on inadequate or erroneous information. This makes it imperative to give out information to the public through the common mass media about the achievements of research and development work in the national laboratories and their social and economic implications in order that people will have a correct and realistic appraisal of the valuable contribution of science and technology. A potential method of doing this is through press handouts on important scientific developments or achievements and events for publication and broadcast. 25 to 30 press releases will be issued every year.

3. Objectives:

i) To keep the public adequately informed of important scientific developments, achievements and events so that they can have a realistic appraisal of contributions made by research and development, thereby helping to secure public support for research and development work.

ii) To create interest in research developments with the ultimate objective of their commercial utilisation.

4.1 Nature of activity: Technical.

4.2 Classification: Dissemination of information.

4.3 Orientation: Publicity and public education.

5. Period: April 1972 to March 1979.

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Popular articles (Publicity and Public education-
English and Indian languages).

2. Justification:

Communication of new knowledge emerging from modern research to the general public can inculcate new attitudes and a spirit of rational inquiry amongst them so that they turn to science and technology to transform social and economic life. The leaders of the industry also should be informed of latest developments in research and facilities and services available with regard to starting of new industries. Publication of popular science articles in the press is one of the methods of communicating with the literate people. 20-24 articles on specific subjects will be prepared in English and Indian languages and issued for publication in the newspaper dailies and magazines every year. These articles will be of three types (i) those aimed at the general public, (ii) those aimed at large scale industries, and (iii) those aimed at medium and small scale industries.

3. Objectives:

i) To stimulate public and industrialists' interest in and receptivity to new ideas emerging from research and development thereby paving the way for social and economic development of the country;

ii) To inform the members of the large, medium and small scale industries of the advances in food research as well as consultancy services and facilities available in starting new industries or in modernisation of industry on sound technological foundations.

4.1 Nature of activity:

Technical.

4.2 Classification:

Dissemination of
information.

4.3 Orientation:

Public education.

5. Period:

April 1972 to March 1979.

Discipline: Industrial Research,
Consultancy & Extension.

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Popular journals on nutrition, food science and technology in (a) Kannada, (b) Hindi, (c) Tamil, (d) Telugu, and (e) Malayalam (Public education).

2. Justification:

New knowledge emerging from research and development work as well as scientific knowledge already available in the spheres of food science and technology are to be conveyed to the common man in terms of its usefulness and value to make him realise how this can contribute towards improvement in his living conditions and to dispel ignorance, taboos and superstition rampant among the masses which are barriers to progress. At the same time people are to be educated to utilize traditional food techniques more effectively on modern scientific basis. Such useful information can be presented effectively only through the medium which the common man can understand. Language publications constitute one such medium.

The popular quarterly journal published by the CFTRI in Kannada since 1956 has been accepted very favourably by the public and this pilot work is showing high potentials. Encouraged by this a quarterly journal in Hindi is also published. The Kannada journal will be issued as a bimonthly from 1973-74 onwards. It is proposed to publish popular journals in Tamil, Telugu and Malayalam also from 1974-75 so as to reach a wider section of the Indian population in other language groups. It is proposed to publish all the journals as bimonthlies commencing from the V Plan Period.

3. Objectives:

The journals are aimed at educating the public and educators especially the community development workers, farmers, social welfare organisers, students, teachers, trainees and housewives in the basic as well as accumulated and new knowledge from research and development in the fields of nutrition, food science and technology.

The ultimate objective is to communicate with as much of the literate population as possible mostly through organisations such as C.D. Blocks, village panchayats, libraries, schools, colleges, primary health units, etc., who become subscribers, to effectively establish rapport and communication between the research institute and the masses.

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| 4.1 | <u>Nature of activity:</u> | Scientific. |
| 4.2 | <u>Classification:</u> | Dissemination of
information. |
| 4.3 | <u>Orientation:</u> | Educating the public and
educators. |
| 5. | <u>Period:</u> | Continuous. |

Discipline: Industrial Research,
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Food Technology News Letter (English)
(Publicity and public education)

2. Justification:

Research itself will lose some of its reality if it is insulated from the forces which motivate and give its meaning. Dissemination of information on advances in research with their possible impact on industrial development is, therefore, one of the essential function of any Institute concerned with task-oriented research. Such information can be successfully transmitted directly to the leaders of the industry, chambers of commerce, etc., in the form of a news letter. It is, therefore, proposed to start a quarterly news-letter (to begin with in English only) to cater for information needs of the industry.

3. Objectives:

- (i) To help in the development process by informing the leaders of the industry about the advances in research, thereby stimulating motivation to utilise results of research in modernising industry on sound technological basis or in starting new industries.
- (ii) To secure the utilisation of processes and products emerging from research and the services and facilities provided by the Institute.

4.1 Nature of activity: Technical

4.2 Classification: Dissemination of information

4.3 Orientation: Public education

5.0 Period: 1974 - 1979

Discipline: Industrial
Research,
Consultancy &
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Popular brochure - English & Hindi
(Publicity & Public education)

2. Justification:

Communication of new knowledge emerging from modern research to the general public can inculcate new attitudes and a spirit of rational enquiry amongst them so that they turn to science and technology to transform social and economic life. The leaders of the industry also should be informed of latest developments in research and facilities and services available with regard to starting of new industries and in the day-to-day operational problems. Popular brochures are one of the essential tools to inform and educate the intelligentsia. There is also a great demand for such brochures from a large number of students, extension workers, educationist and industrialists who visit the Institute. Four brochures will be brought out in English and Hindi every year during 1972-74. In the Fifth Plan it is intended to publish the brochures in other major Indian languages depending upon the requirements.

3. Objectives:

- (i) To stimulate the public and industrialists interested in new ideas emerging from research;
- (ii) To inform and educate the public, and opinion leaders about advances in food research;
- (iii) To inform the new entrepreneurs of the advances in food research as well as consultancy services and facilities available in starting new industries or in modernisation of industry on sound technological foundations so as to contribute effectively to economic growth.

4.1 Nature of activity: Scientific

4.2 Classification: Dissemination of information.

4.3 Orientation: Public education

5.0 Period:

Discipline: Industrial Research,
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Audio Visual Aids - Film (Publicity and education)

2. Justification:

Public education is vitally important to create a scientific temper and awareness among the people and motivate them so as to hasten social and economic development of the country. The existing tools of mass media will have to be effectively used to communicate with the people. In India where only 29.3 per cent of the population is literate, the vocabulary of the press makes its message inaccessible to over 70 per cent of the population who are illiterate. Audio-visual aids are one of the tools to reach the illiterate masses. Films, especially, have an important role in modernising the people, providing them education and informing them about latest developments in science. Nearly 12,000 people visit the Institute every year, and film is an effective medium to explain to them quickly the research developments by providing an instant background of the accomplishments of the Institute. The film that we have at present is outdated and it does not give a picture of the developments since 1962. It is, therefore, proposed to arrange for producing an educational film in 1973-74 highlighting the accomplishments in major areas of food science and technology. Other audio-visual aids such as slides with tape-recorded commentary will also be introduced in order to facilitate explaining the work of the Institute to people of different regions in their regional languages.

3. Objectives:

- i. To provide a background of the activities of the Institute to visitors of the Institute.
- ii. To screen in educational institutions and to village level workers, thereby communicating with them about advances in research.

iii, To create a scientific temper and awareness among the people and motivate them so as to help hasten social and economic development.

- 4.1 Nature of activity: Technical
- 4.2 Classification: Dissemination of information
- 4.3 Orientation: Public education
- 5.0 Period: April 1974 to January 1975

Discipline: Industrial Research
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Exhibition (Publicity and publication)

2. Justification:

Public education is vitally important to create a scientific temper and awareness among the masses which are pre-requisites for speeding up social and economic development. The existing mass media will have to be effectively used to communicate with the public. It will stimulate a quick emotional response by creating an awareness or reinforcing ideas through attractive display of charts, pictures and products and and through demonstrations which will convey visually the message at a glance. Based on previous experience it is proposed to participate in 3 to 4 permanent exhibition at CFTRI, as nearly 12,000 people presently visit the Institute every year. This work will be taken up in 1973. There is also a need for mobile exhibition unit so that it can cater for students and general public in rural areas. It is proposed to start the mobile unit during the fifth five year plan.

3. Objectives:

- i) To inform and educate the public, especially students, housewives, the industrialists and neoliterates about advances in food research and development and its role in raising nutritional standards and in modernising food industry;
- ii) To stimulate public interest in and receptivity to new ideas emerging from research and development;
- iii) To establish dialogue between research workers and industry.

4.1 Nature of activity: Technical

4.2 Classification: Dissemination of information

4.3 Orientation: Public education

5.0 Period: April 1972 to March 1979

Discipline: Industrial Research,
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Script for Radio talks (Publicity and
Public Education)

2. Justification:

Public education is vitally important for creating a scientific temper and awareness among the people, and motivate them so as to hasten social and economic development of the country. In India where only 29.3 per cent of the population is literate, the vocabulary of the press makes its message inaccessible to over 70 per cent of the population who are neo-literate or illiterate. Therefore, in addition to publications, other available media are to be used for communicating with the people. Radio is a powerful medium to educate people and mould public opinion. It covers 80 per cent of the total area of India and 70 per cent of its population. This medium will, therefore, be used more frequently than before to focus attention on the important problems in the field of food and nutrition and explain practical solutions evolved by research and development.

3. Objectives:

To focus attention on the important problems in the field of food and nutrition and explain practical solutions evolved by research and development in terms of their usefulness and value and to make the people realise how these can contribute to the improvement of their life and thus dispel ignorance, traditional taboos and superstitious beliefs which are the barriers to social and economic progress.

4.1 Nature of activity: Scientific

4.2 Classification: Dissemination of
information

4.3 Orientation: Public education

5.0 Period: April 1972 to March
1974.

Discipline: Industrial Research, Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Press visits and press conference (Publicity and Public Education)

2. Justification:

Public education is vitally important to create a scientific temper and awareness among the masses which are pre-requisites for speeding up social and economic development. Various communication techniques have to be adopted to inform and educate the people and to project the image of the Institute. Writings of well-known columnists on the work of the Institute will have a greater impact than official press releases. Therefore, it is proposed to start a scheme to invite at least six leading columnists from major and medium newspapers and news agencies to visit the Institute every year and provide them with facilities and prepare write-ups for the papers. Periodical press conferences will also be arranged to enable the newsmen to give a realistic appraisal of the Institute in the press.

3. Objectives:

To project the image of the Institute by:

- i) encouraging leading columnists to write about the work of the Institute and publish it in newspapers;
- ii) holding press conferences periodically to enable newsmen to give a realistic appraisal of the work of the Institute in the press.

4.1 Nature of activity: Technical

4.2 Classification: Dissemination of information

4.3 Orientation: Public education

5.0 Period: April 1972 to March 1979

Discipline: Industrial Research,
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Photo Art Services (Publicity, public education and dissemination of scientific information)

2. Justification:

Photo art services are an essential requirement for preparing publicity and exhibition material, technical papers and publications, as well as for presentation of papers and for talks at scientific conferences, symposia and seminars. The services include taking and developing picture shorts, preparation of slides, charts, graphical illustrations, etc. With the expansion of activities especially public education and publicity projects proposed for the Fourth and Fifth Five Year Plans, the demand on these services will increase tremendously.

3. Objectives:

- i) To provide photographic services for preparing technical, publicity and extension literature.
- ii) To prepare slides, charts, graphical illustration, etc., for various research projects, scientific conferences, symposia and seminars, popular and technical publication and in exhibitions.
- iii) To provide photograph of important developments and events to the newspapers and magazines.

4.1 Nature of activity: Technical

4.2 Classification: Dissemination of information.

4.3 Orientation: Publicity and public education.

5.0 Period: April 1972 to March 1979

Discipline: Industrial Research, Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Visitor service and Open Days (Public Education)

2. Justification:

Nearly 12,000 people, mainly students, community project workers and educators, agriculturists and industrialists visit the Institute every year. This enables them to have first hand information about the activities of the Institute and to appraise the role of the Institute in helping the modernisation of the industry and in raising the nutritional standards of the people. Visitor services such as conducting trips round the Institute, special talks for students, screening of scientific films, etc., will, therefore, be provided regularly twice a day on working days. Twenty seven staff members participate in the visitor service programme and each devote about 15 days in a year to this programme. Open Days also will be held once a year to provide the public a glimpse of research and development work of the Institute. The Open Days held in 1969 and 70 proved very successful and nearly 10-12 thousand people visited the Institute on each of these occasions, and took keen interest in the contribution of the Institute. Past experience has shown that these programmes have a great impact on the public.

3. Objectives:

- i) To enable the visitors to have a glimpse of the work of the Institute.
- ii) To create a better appreciation of the role of food technology in socio-economic development.

4.1 Nature of the activity: Scientific

4.2 Classification: Dissemination of information

4.3 Orientation: Public education

5.0 Period: April 1972 to March 1979

Discipline: Industrial Research,
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Press clippings

2. Justification:

The members of the Institute have to be kept informed of the developments in the country having a bearing on the research work of the Institute or which will be useful in orienting the research and development work. Public reaction about the work of the Institute will also have to be constantly evaluated to project a realistic image of the Institute. In this regard, regular press clipping service is a necessity.

3. Objectives:

- i) To provide information to the members of the Institute on the developments in the country which have a direct bearing on the Institute, or which will be useful in orienting the work of the Institute.
- ii) To evaluate the public reaction to the work of the Institute which will help in projecting a realistic image of the Institute to the public, and
- iii) To maintain useful press clippings as reference material and to use them as a source to collect additional information, if required.

4.1 Nature of activity: Technical

4.2 Classification: Collection of information

4.3 Orientation: Education and evaluation

5.0 Period: April 1972 to March 1979

Discipline: Engineering and
Maintenance

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Design fabrication of glass apparatus and equipment required for the research programmes of the Institute.

2. Justification:

About Rs.50,000/- to Rs.60,000/- worth of special glass apparatus is purchased by the Institute to suit the experimental requirements of the research scientists. More often, getting the apparatus from outside and sometimes even by importation, is time consuming and may also result in a lot of breakage due to bad packing and handling. It is, therefore, that all such /desirable apparatus is made in the Institute itself, to save on time and for the convenience of the scientists. Necessary skill and equipment are available in the Institute.

3. Objectives:

Design and fabrication of all specialised glass apparatus required by the Research Scientists for various projects of the Institute and for technical assistance to other laboratories, universities and other research institutes.

4.1 Nature of activity: S cientific

4.2 Classification: Design and fabrication

4.3 Orientation: Other substitution

5.0 Period: 1972 to 1979

Discipline: Experiment Station
Mangalore

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Collection of analytical data on Indian Marine Fishes and Fish Products of commercial importance.

2. Justification:

Several types of marine fish abound in Indian Waters which are estimated to have yield potential of about 13 million tonnes per year. Certain basic analytical data of the more important commercial fishes are essential for proper planning of their industrial potential. Systematic collection of such data would also be a guideline for more economic utilisation of the fish. Also, there is need to analyse different types of fish products that are commercially produced in India to evaluate their quality and help the industry in better quality control.

3. Objectives:

Collection and compilation of analytical data on marine fish and fish products relating to characteristics that have a bearing on their processing and preservation.

Recommendation of new species of fish and optimum processes based on the analytical data for use in fish processing industries for preparation and evolution of new products.

Recommendation of optimum holding conditions of different species of fish prior to processing and marketing.

Rendering analytical assistance to fish processing industry.

4.1 Nature of activity: Scientific

4.2 Classification: Material research

4.3 Orientation: Raw material utilisation

5.0 Period: June 1972 to June 1975

Discipline: Experiment Station, Mangalore

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Publication on " Traditional Fish Products of India: Its Scope and Potentiality ".

2. Justification:

20% of total marine landing (i.e., 2,50,000 tonnes) is processed by traditional method of salting and/or sun drying. Central Food Technological Research Institute has carried out considerable amount of work in this area. Most of the work is published in scientific journals and a portion of data is available in the annual report. Furthermore, scientific research publications are not sufficient to cater to the need of progressive industrialists, co-operatives, fisheries corporations, who are interested to operate production in a scientific way.

3. Objectives:

To disseminate available information and data on various aspects of traditional fish products of India.

4.1 Nature of activity: Technical

4.2 Classification: Extension

4.3 Orientation: Welfare

5.0 Period: April 1975 to March 1976.

Discipline: Experiment Station,
Mangalore

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Monograph on "Fish meal and oil industry in India "

2. Justification:

Fish meal and oil industry is an established industry in India. Production is still carried out on a cottage industry scale and only a couple of units have started operating with modern machinery. Manufacture of fish meal and oil forms an important part of programme of many cooperative fish marketing federations, fisheries corporation and entrepreneurs.

CFTRI Fish Technology Experiment Station has carried out work on the production of fish meal and oil. Data are distributed in published and unpublished reports. Compilation of publication of the above data and data already available in literature will be of help to the industrialists and entrepreneurs in the line.

3. Objectives:

To disseminate available information and data on various aspects of fish meal and oil production for the benefit of the industry.

4.1 Nature of activity: Scientific

4.2 Classification: Extension

4.3 Orientation: Welfare

5.0 Period: April 1974 to March
1975

Discipline: Experiment Station
Ludhiana

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Survey of marketable surplus fruits and vegetables of the region in relation to processing industries.

2. Justification:

For any systematic planning of work, non-availability of authentic information about production and available surpluses of fruits and vegetables in any region and the estimated requirements of the preservers for these perishable material is a great hindrance.

A combined survey of the current production as also the production potential of these perishables in different regions with due regard to their take-off by the fresh market and the processing units (present and anticipated additions) is essential for the planning of horticulture and preservation developments.

Considering the importance which fruits and vegetables have, this group has been selected on priority basis.

3. Objectives:

1. Collection of authentic information about present production, available surpluses and scope for increasing production of different fruits and vegetables of the region.
- ii. Assessment of the present and the future requirement of these commodities by the food processors of the region.
- iii. Work out the future lines of technological investigation.

4.1 Nature of activity: Scientific

4.2 Classification: Material research

4.3 Orientation: Raw material utilisation

5.0 Period: April 1972 to March 1974

Discipline: Experiment Station,
Bombay

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Analyses of fruit and vegetable products
under FPO

2. Justification:

Specifications and standards have been laid down under the Fruit Products Order 1955 for the commercial manufacture of fruit and vegetable products. Since last ten years, these samples were sent to CFTRI, Mysore, for analysis. Considering the delay in transit of samples and to render on-the-spot advise to the manufacturers, it was considered advisable to carry out the analysis of commercial samples from the Bombay region at Experiment Station, Bombay. In addition, samples of fruit and vegetable products meant for export are required to be analysed with regard to their quality prior to their shipment. This project has therefore been undertaken with a view to analyse commercial fruit and vegetable products regarding their conformity with F.P.O. Specifications and for export.

3. Objectives:

1. Analysis of commercial samples of fruit and vegetable products with regard to their conformity with F.P.O. specifications.
2. To analyse fruit and vegetable products meant for **purpose** of export.
3. To help the manufacturers in the quality control of the products.
4. Analysis of commercial samples would help in the enforcement of F.P.O. regulations and thereby prevent the manufacture of **sub-**standard products either for local market or for export. The advice rendered on the basis of the analysis would also help in improving the quality of the product.

- | | | |
|-----|----------------------------|----------------------|
| 4.1 | <u>Nature of activity:</u> | Technical |
| 4.2 | <u>Classification:</u> | Product Research |
| 4.3 | <u>Orientation:</u> | Quality Control |
| 5.0 | <u>Period:</u> | From 1962-continuous |

Discipline: Experiment Station,
Bombay

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Survey of incidence of infestation in
field beans

2. Justification:

1,00,000 bags of val (field bean) are annually
traded in Bombay. The incidence of Bruchus
in Val is high resulting in 15-25 per cent
spoilage of Val. A study of the incidence of
spoilage would help in saving the above losses.

3. Objectives

- i) Observations at the producing and
receiving centres and also at transit to
assess the nature and extent of damage.
- ii) Application of pesticidal formulations and
fumigation to minimise the losses.

4.1 Nature of activity: Scientific

4.2 Classification: Materials Research

4.3 Orientation: Raw material conser-
vation

5. Period: March 1974 to
March 1977.

Discipline: Experiment Stations

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Analysis of Food Products (or raw materials) from private parties for the purpose of quality control and improvement of quality.

2. Justification:

Food Processing in India is mostly carried out in sectors of small scale and medium scale industries which generally do not have any analytical facilities of their own for the purpose of quality control or for the improvement of the quality of their products. The Experiment Stations located in different parts of the country can contribute in this matter by undertaking analysis of raw materials involved in processing or finished products. This will be of great service to these sectors in improving and maintaining the quality of different processed food products.

3. Objectives:

To undertake analysis of (a) Food Products and (b) Agricultural and other commodities used for processing for the purpose of controlling and maintaining the quality of finished products.

4.1 Nature of activity: Technical

4.2 Classification: Consultancy

4.3 Orientation: Quality Control and
Product Improvement

5. Period: April 1972 - continuous

Discipline: Experiment Station,
Nagpur

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Monograph on Nagpur Oranges

2. Justification:

Considerable data have been reported in the literature on citrus fruits. No compiled data on Nagpur Oranges as such is available. Taking into consideration the importance of the primary orange growing industry in the region, it is desirable to prepare a monograph on Nagpur 'Santra'. This will benefit all agencies connected with this primary industry and particularly the entrepreneurs.

3. Objectives:

To disseminate accumulated data on various aspects of oranges and make available guidelines for setting up processing units for the benefit of industry as well as prospective entrepreneurs.

4.1 Nature of activity: Scientific

4.2 Classification: Extension

4.3 Orientation: Welfare

5. Period: April 1976 to March 1978

Discipline: Experiment Station
Trichur

OTHER SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES

1. Project Title:

Monograph on Pineapple

2. Justification:

The CTRTI Experiment Station has carried out work on various aspects of processing pineapple. The data are distributed in published and unpublished reports. Compilation and publication of the above data and the data already available in literature in the form of a monograph will be of help to the growers and processors.

3. Objectives:

To disseminate the available data on various aspects of pineapple to the industry.

4.1 Nature of activity: Scientific

4.2 Classification: Extension

4.3 Orientation: Welfare

5. Period: April 1972 to
March 1973.

Discipline: Experiment Station,
Trichur

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Survey of Jack fruit for the purpose of
its use as processed food products

2. Justification:

In Kerala State jack fruit is available in plenty. The fruit is also quite common in other parts of India (Tripura, 1,67,640 tonnes, West Bengal, Bihar, etc.). It is used locally in raw state in food preparations and in ripe state. There is need to study the possibility of use of jack fruit as processed food with long shelf life.

3. Objectives:

Objective of the project is to undertake a survey and study to find out the possibility of using the fruit in the form of processed products.

4.1 Nature of activity: Scientific

4.2 Classification: Product Research

4.3 Orientation: Raw material utilisation

5. Period: April 1972 to
March 1974.

Discipline: Process Development
& Design

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Testing of packaging materials and packages for the industry, I.S.I. and other institutions and to improve the testing facilities in the laboratory.

2. Justification:

The testing of packages and packaging materials is almost an uninterrupted activity of the packaging unit. In addition to the laboratory research needs, several industries (both users and packaging material manufacturers) are making use of the testing facilities available in this laboratory. Besides, the facilities available here are also used by other public institutions like the Indian Institute of Packaging, I.S.I. and Defence Science Laboratories.

3. Objectives:

- i) To extend the testing facilities to industries particularly in small scale sector, defence and other public institutions in the evaluation of packaging materials and packages.
- ii) To assist the I.S.I. in developing specifications on packaging materials and packages.

4.1. Nature of activity: Technical

4.2. Classification: Materials

4.3. Orientation: Development
(Industrial & Economic)

5. Period: January 1970 to
January 1974.

Discipline: Sensory Evaluation

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Evaluation of products from other Disciplines.

2. Justification:

We have equipped a Sensory Evaluation Laboratory and are specialising in the field, to collaborate with other Disciplines and Industries in their research and development problems. Acceptance of any food is predominantly dependant on its sensory quality.

3. Objectives:

To evaluate quality of products developed in other Disciplines/Industries.

To evolve quick reference evaluation methods and to train the staff of the Institute, Industries and other Institutions for Sensory Evaluation of different types of foods.

4.1 Nature of activity: Scientific

4.2 Classification: Materials and
Products Research

4.3 Orientation: Raw material utilisation/Welfare/Quality control of treated, improved or stored products.

5. Period: January 1972 to
March 1979

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Survey on utilisation of waste products of poultry industry such as spoiled eggs and eviscerated material of dressed poultry.

2. Justification:

It has been claimed by Bose (1965) that one out of every four eggs produced in the country do not reach the hands of the consumers. Similarly, in one of the recent reports Ranganathan (1970) has estimated that the country is incurring a loss of 5 crores due to spoiled eggs. Apart from this, there are also evidences to show that a large quantity of poultry viscera is being wasted in different poultry dressing plants of the country. All these items put together might work out to a huge sum which at present is going as waste. Hence it is worthwhile to find out how best they can be utilised. But, before proceeding for the same, an exact estimate of the availability of these items from different parts of the country from various sources is to be properly calculated. Keeping this in view the present investigation has been planned.

3. Objectives:

- i) Assist the poultry industries in providing them a solution for profitable use of their waste material.
- ii) Minimise the losses incurred by the country through the above items.

4.1 Nature of activity: Scientific

4.2 Classification: Product/Process
Research

4.3 Orientation: Waste Utilisation

5. Period: April 1972 to March 1974.

Discipline: Industrial Research
Consultancy and
Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Study of the economics of rice milling

2. Justification:

Approximately 40 million tonnes of rice is consumed annually in India. About two-thirds of this, valued at nearly Rs.40,000 million is the product of commercial milling. Progressive modernisation of more than 45,000 rice mills has started with the licencing of manufacturing rice milling machinery of improved design. This programme is beset with problems of higher investments and higher maintenance costs compared to older type rice mills. There are also incentives to modernisation, namely, 2.5% to 6.6% higher total rice yield and 6 to 15% higher head rice yield. Comparative study of the economics of rice milling with older type mills and modern mills has not been made taking into account (i) investments on machinery and building, costs of maintenance, raw material, storage and management, and (ii) the pay off on increased milling capacity, increased yields of rice and superior quality of rice.

3. Objectives:

- i) To examine the profitability of rice milling with modern machinery.
- ii) To optimise the cost of milling by a minimum cost programme of buying the raw material required for milling.

- 4.1 Nature of activity: Scientific
- 4.2 Classification: Industrial Management
- 4.3 Orientation: Conservation
- 5 Period: April 1977 to May 1979.

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

A survey of by-products and industrial wastes of food and fermentation industries.

2. Justification:

This information is required by the Research workers to formulate projects on utilisation of wastes for food and feed purposes.

3. Objectives:

To find out quantum of wastes in the following industries:

- i) Distilleries
- ii) Breweries
- iii) Wineries
- iv) Fish and Seafoods
- v) Nuts
- vi) Meat
- vii) Starch and its derivatives
- viii) Fruit & vegetables
- ix) Dhal milling
- x) Dairy Products &
- xi) Flour milling

Survey will be carried out by issuing a suitable questionnaire and by visiting a few selected factories.

4.1 Nature of activity: Scientific

4.2 Classification: Material Research

4.3 Orientation: Waste Utilisation

5. Period: 1972 - 1979.

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES ,

1. Project Title:

Uniform cost accounting system for medium
and small scale food industries

2. Justification:

There are about 12,000 firms manufacturing food products, of which more than 11,000 fall in the category of cottage scale and small scale food industries and more than 900 fall under medium scale food industries. Costs of production can be reduced and controlled using the tool of interfirm comparison for which a uniform costing system has to be evolved. At present, there is no system of effective cost controlling in the medium and small scale industries.

3. Objectives:

i) To develop a uniform system of costing for the small scale and medium scale food industries.

ii) To examine its validity for rice milling

iii) To extend the system of costing developed as above to other food processing industries.

4.1 Nature of activity: Technical

4.2 Classification: Industrial Management

4.3 Orientation: Conservation

5. Period: June, 76 to May, 78

Discipline: Industrial Research,
Consultancy & Extension

OTHER SCIENTIFIC & TECHNOLOGICAL ACTIVITIES

1. Project Title:

Measurement of Research & Development
Output of CFTRI during the ten year period
1964 to 1973

2. Justification:

Resources for Research & Development are limited and a sense of awareness of this fact among the scientists would help to optimise the returns from expenditure on Research and Development. Accountability for such expenditure is necessary as the funds for Research and Development are provided from the public exchequer as well as private sponsors. An appraisal of the pay off on the Research & Development expenditure also aids in justifying the investments made on Research & Development. The period which is to be covered under this study is of special interest as the project oriented research programme was adopted at CFTRI in the year 1964. The study will also be an evaluation of the Research & Development under the new system.

3. Objectives:

- i) To evolve the parameters needed for measuring Research & Development Output.
- ii) To develop the measures of the Research & Development Output in terms of money value.
- iii) To streamline the system of generating data on the inputs into and output of Research & Development.
- iv) To work out the relation between the investments on Research & Development and the pay-off on them at CFTRI.

4.1 Nature of activity: Technical

4.2 Classification: Research Management

4.3 Orientation: Research Utilisation

5. Period: April, 1974 to March, 1976

TRAINING OF PERSONNEL TO MEET THE
REQUIREMENTS OF R&D, INDUSTRY
AND THE GOVT. AGENCIES
(IV & V Five Year Plans)

Sl. No.	Title	Page
1.	Advanced Training in Food Science and Technology (1972-74)	418
2.	Advanced Training in Food Science and Technology (1974-79)	419
3.	Training Extension Trainees and Para-Medical Staff of Family Planning Centres in Nutrition Education and grain protection in rural areas	420

Discipline: Training Centre

TRAINING OF PERSONNEL

1. Project Title:

Advanced Training in Food Science and Technology

2. Justification:

There has been a steadily increasing demand from food industries for trained personnel in food science and technology. To meet this growing demand it has become absolutely essential to train suitable persons in the several fields of food science and technology.

The training facilities of the Institute were extended to the South and South East Asian Countries from 1965 through the cooperation of the FAO. An International Food Technology Training Centre has been established at the Institute. The continuation of the Centre through UNDP assistance is under consideration of the Government of India.

3. Objectives:

a) To train personnel at post-graduate level for the food industries, government departments and research institutes.

b) To train personnel at the middle level in industry in upgrading their knowledge and skill by refresher courses of short duration in several specialised fields of food science and technology.

4.1 Nature of activity: Training

4.2 Classification: Extension

4.3 Orientation: Development (industrial and economic)

5. Period: From 1972 to 1974

Discipline: Training Centre

TRAINING OF PERSONNEL

1. Project Title:

Advanced Training in Food Science
and Technology

2. Justification:

There has been a steady demand from food industries for trained personnel in food science and technology. To meet this growing demand it has become absolutely essential to train suitable persons in the several fields of food science and technology. The training facilities of the Institute were extended to the South and South East Asian Countries from 1965 through the cooperation of the FAO. An International Food Technology Training Centre has been established at the Institute. The continuation of the Centre through UNDP assistance is under consideration of the Government of India.

3. Objectives:

a) To train personnel at post-graduate level for the food industries, Govt. Departments and research institutes.

b) To train personnel at the middle level in industry in upgrading their knowledge and skill by refresher courses of short duration in several specialised fields of food science and technology.

4.1 Nature of activity: Training

4.2 Classification: Extension/Training

4.3 Orientation: Development (industrial & economics)

5. Period: From 1974-1979 (to be continued in the Sixth Plan).

Discipline: Industrial Research,
Consultancy & Extension

TRAINING OF PERSONNEL

1. Title:

Training Extension Trainees and Para-Medical Staff of Family Planning Centres in Nutrition Education and grain protection in rural areas.

2. Justification:

CFTRI is now looked upon as authority on nutrition, food-science and technology by social welfare authorities and Community Development Blocks in Mysore State. There are about 1380 women workers (Mukhyasevikas) Para-Medical staff working in rural areas, with more than 1010 organised welfare centres like Balawadi, Mahila Mandals, Family Planning Centres, etc. The Institute has been asked several times by Block authorities to demonstrate and give advice on nutrition, conservation and preservation aspects of foods. Although these demands have been met with partially, it is necessary to concentrate on actual rural field workers.

3. Objectives:

To impart practical training on application of important principles of nutrition and grain conservation like: (i) use of mixed cereals, cereals/pulses combinations in the diet, and (ii) inclusion of locally grown fruits and vegetables in the diet, (iii) diets for expectant and lactating mothers and (iv) preparation of home made weaning foods, and (v) care and conservation of food grains at home- to extension workers, trainers and para-medical staff. (This will be within the socio-economic frame work of the villages in Mysore State).

- 4.1 Nature of activity: Training
- 4.2 Classification: Extension
- 4.3 Orientation: Welfare

5. Period: October, 1973 to March, 1975

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

Sl. No.	Title	Page
1.	a. Fabrication of special food processing equipment	422
	b. Fabrication of equipment in collaboration with various Disciplines	
2.	Improvements to the water supply of the Institute - (a) Installation of additional bore wells; (b) Pressure filter and water softening system for borewell water	423
3.	Essential supply of steam for pilot plants and other project works	424
4.	Construction of cold storages and temperature and humidity controlled rooms and maintenance of equipments	425
5.	Installation of a centralised kerosene oil gas plant	427
6.	Receiving and distribution of power, installation of services to new buildings and equipment	428
7.	Construction of laboratory buildings and services	430
8.	Installation of 100/400 Type PAX Telephone Exchange with accessories	431
9.	Supply of distilled water to the Laboratories	432

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT AND MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

- a. Fabrication of a special food processing equipment
- b. Fabrication of equipment in collaboration with various Disciplines

2. Justification:

Fabrication of these equipments are in the nature of a developmental work. These are not standard equipments available in the market and have to be specially designed and proto-type fabricated and tested

Care is being taken to use maximum number of standard components in the fabrication and also before taking up fabrication, a survey will be made to find out the feasibility of using available equipment with required modifications

3. Objectives:

- i) To provide the vital and essential equipment required for R&D in the Institute
- ii) To achieve self-sufficiency in and minimise import of food processing equipment

4.1 Nature of activity: Scientific

4.2 Classification: Design and Fabrication

4.3 Orientation: Import Substitution

5. Period: 1972 to 1974

1974 to 1979

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Improvements to the water supply of the Institute -

- (a) Installation of additional bore wells;
- (b) Pressure filter and water softening system
for borewell water

2. Justification:

At present, supply of water to the Institute and the campus is by municipal mains and 3 borewells. Since the activities of the Institute are increasing every year due to the addition of new laboratories, buildings, pilot plants etc., it is intended to meet the additional demands of water by drilling 6 more bore wells during the IV, V and VI Plan periods

3. Objectives:

To provide adequate supplies of water to the laboratories, research projects and pilot plants

- 4.1 Nature of activity: Technical
- 4.2 Classification: Maintenance of essential services
- 4.3 Orientation: Promoting research/Welfare
- 5. Period: 1972 - 1974
1974 - 1979

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Essential supply of steam for pilot plants and
other project works

2. Justification:

There are 5 oil fired boilers in the Institute. Two
in the Technology block; one in Main building; one at
Meat, Fish & Poultry Technology block and one at the
Synthetic Rice Plant block. It is necessary to have
two more boilers for additional capacity and replace-
ment in due course of time.

3. Objectives:

Essential supply of steam to pilot plants

4.1 Nature of activity: Technical

4.2 Classification: Maintenance of essential
services/Process Research

4.3 Orientation: Promoting research work

5. Period: April 1976 - March 1978

April 1979 - March 1981

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Construction of cold storages and temperature and humidity controlled rooms and maintenance of equipments

2. Justification:

- a) Design and construction of cold storages and temperature rooms as indicated below for research work:

IV Plan:

- 1) Cold room and A.C. rooms for fermentation work of 'M' Discipline
- 2) Temperature and humidity controlled room for Packaging Section
- 3) Freezing cubicles for Meat, Fish & Poultry Technology Discipline
- 4) A.C. rooms for Central Instruments Laboratory
- 5) Cold rooms and A.C. rooms for Animal House

V Plan

Cold rooms and temperature and humidity controlled rooms for 'Biochemistry' and 'Fruit & Vegetable Technology' Disciplines in new buildings

- b) Providing facilities needed for systematic maintenance of these equipments.

3. Objectives:

- a) Design and construction of cold, temperature and humidity controlled rooms as per details given above.
- b) Provision of a well equipped workshop for the testing, repair and maintenance of all types of refrigeration and air-conditioning equipment during 1972-74

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|-----|----------------------------|---|
| 4.1 | <u>Nature of activity:</u> | Technical |
| 4.2 | <u>Classification:</u> | Design and Fabrication |
| 4.3 | <u>Orientation:</u> | Creation of facilities for product research |

5. Period:

<u>1972-73</u>	<u>1973-74</u>	<u>V Plan</u>
a) Cold room and A.C. room for 'M' Discipline	a) A.C. rooms for Central Instruments Laboratory	Cold rooms and temperature & humidity controlled rooms
b) Freezing cubicles for MF'PT Discipline	b) Cold room and A.C. room for Animal House	for 'B' and FVT Discipline lines in new buildings
c) Temperature and humidity controlled rooms for 'P' Section		
d) A.C. rooms for Central Instruments Laboratory		

Refrigeration Unit

We have now 12 cold storage rooms each of a capacity of 500 cft approximately; 5 walk-in-coolers of 300 cft capacity each; 7 cold chambers of 100 cft capacity each and a large number of refrigerators, air conditioners, deep freezers, water coolers and humidity and temperature controlled rooms. With the increase in the activities of the different disciplines, more number of cold storages and other refrigeration equipment will be added during the Plan periods. A preventive maintenance procedure in respect of most of the smaller units has already been put into effect. This will be done for all the other units also during the rest of the IV Plan period.

This Unit will also supervise construction of new cold storages and temperature and humidity controlled rooms depending on the needs of the research disciplines during the V and VI Plan periods. It will also advise industry on problems of cold storages.

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Installation of a centralised kerosene oil
gas plant

2. Justification:

We have 7 petrol gas plants which are located at various parts of the campus. All these are of small capacity of the order of 50 to 300 burners each. The gas pressure in these plants is not adequate and there is considerable pressure drop in the lines feeding the laboratories particularly those located at the far end of the gas lines. To get over this, more number of plants will have to be installed. Also the number of buildings and laboratories are increasing and it is not economical to have many such small individual units because the running cost of the petrol gas plant is higher compared to a kerosene gas plant since SBP spirit costs Rs. 1.43/litre as against Rs. 0.66/litre for kerosene. Per unit volume kerosene generates more gas than petrol

3. Objectives:

To maintain essential supplies of gas to the laboratories

4.1 Nature of activity: Technical

4.2 Classification: Maintenance of essential
services

4.3 Orientation: Promoting research work

5. Period: April 1974 to March 1976

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Receiving and distribution of power, installation
of services to new buildings and equipment

2. Justification:

These are needed to cater to the increased activity
of the Institute

3. Objectives:

i) (a) Installing a 500 KVA dual voltage transformer and
connected switch gear for the Institute during the
IV Plan;

(b) Installing an emergency stand-by generator set of
100 KVA for the essential services during 1972-73.

ii) (a) Increasing the capacity of the sub-station of the
Institute to 1000 KVA and suitably augmenting the
capacities of the stand-by generator set during
VI Plan;

(b) Also erection of a transformer and switch gear for
the proposed colony in Maragowdanahalli

iii) The connected increase in service facilities required
to be provided as and when required

4.1 Nature of activity: Technical

4.2 Classification: Design and Fabrication

4.3 Orientation: Welfare

5. Period:

<u>1972-73</u>	<u>1973-74</u>	<u>V Plan</u>	<u>VI Plan</u>
100 KVA stand-by Generator set	500 KVA trans- former and switch gear - Other services	Other Services	500 KVA transformer and switch gear - Addi- tional stand- by genera- tor - Other services

The Electrical Section has also to handle testing, installation and maintenance of electrical equipment. With the increase in the activities of the different disciplines, this work will also increase. The section will also have to fabricate new electrical gadgets required for developmental research and modifications of other equipments to suit the need of research, besides looking after the maintenance of the electrical services to the Institute, Quarters and Hostel complex.

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Construction of laboratory buildings and services

2. Justification:

The laboratory and ancillary building space in the Institute is found to be inadequate for the existing strength of the staff itself and the position is expected to be acute with the anticipated increase in staff during IV and V Five Year Plans based on core strength of each Discipline. Therefore, adequate buildings are to be constructed.

3. Objectives:

The Institute presently spreads over a floor area of 2,62,666 sft. consisting of Laboratories, Pilot Plants, Administrative Block and other common facilities. This is equivalent to about 200 sft of space for each scientific worker who are presently 350 persons. The present per capita floor space of 200 sft per person is much less than the International Standard of 300 sft per person of Laboratory space excluding other related facilities. Taking this as a basis, even for the present strength, we need an extra 32,350 sft. of laboratory space in addition to other ancillary buildings. At present this should be provided for during the IV Five Year Plan. For increase in staff upto a maximum of 600 persons as per the core strength, additional floor space required will be 75,000 sft. of laboratories and correspondingly other ancillary buildings related to research activities. **This** space will have to be provided for during the V Five Year Plan.

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| 4.1 | <u>Nature of activity:</u> | Technical |
| 4.2 | <u>Classification:</u> | Construction |
| 4.3 | <u>Orientation:</u> | Research requirements |
| 5. | <u>Period:</u> | April 1972 to March 1979 |

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Installation of 100/400 Type PAX Telephone
Exchange with accessories

2. Justification:

With the expansion in the activities of the Institute the present 100 line PAX Unit is found to be inadequate. As it is 100 line exchange is not able to cope up with the load resulting in constant breakdown of telephone service in the Institute and putting the users to lot of inconvenience. With a view to avoiding increased expenditure in buying a new telephone exchange the system of Mark III main and extension telephone system was introduced. This system is unable to solve the problems of maintenance and service to the users. Hence the new installation is desired

4. Objectives:

Installation of 100/400 Type PAX telephone exchange such as:

- i) main equipment
- ii) lamp display cabinet
- iii) line test case
- iv) power distribution
- v) float charger

4.1 Nature of activity: Technical

4.2 Classification: Installation

4.3 Orientation: Welfare

5. Period: 1972-74 - Float Charger

1974-76 - Rest of the equip-
ment

Discipline: Engineering and
Maintenance

FABRICATION OF EQUIPMENT & MAINTENANCE OF
RESEARCH FACILITIES

1. Project Title:

Supply of distilled water to the Laboratories

2. Justification:

Adequate supply of distilled water is a vital necessity for daily use in the laboratories. At present every Discipline has one or two small plants which are electrically operated to meet the needs of each laboratory. These are giving frequent troubles either due to the fusing of heater coils or choking of the circulating system due to scale formation. Hence it is proposed to have a few centralised distilled water plants to meet the demands of the Institute as a whole

3. Objectives:

Essential supply of distilled water to the laboratories

4.1 Nature of activity: Technical

4.2 Classification: Maintenance of essential services

4.3 Orientation: Promoting Research Work

5. Period: April 1973 to March 1974

AMENITIES FOR R&D PERSONNEL
(IV, V&VI FIVE YEAR PLANS).

Discipline: Engineering and
Maintenance.

AMENITIES FOR R&D PERSONNEL

1. Project title:

Construction of staff quarters.

2. Justification:

The Institute has a strength of about 1000 strong at present and with the increase in the activities in all the disciplines and the corresponding increase in the staff, it is expected that ultimately the total strength of the staff at the end of the 6th plan period will be of the order of 1250. Out of this, if atleast 80% are to be provided with staff quarters, a total of 1000 houses will have to be built.

3. Objectives:

We have at present about 100 houses in the campus and if the expected target is to be reached, 900 more houses will have to be built. Out of this, it may be possible to build around 200 houses in our present campus and the balance in the new colony in Maragowdanahalli. But before this could be done, the land being acquired at Maragowdanahalli is to be developed and main services have to be provided which will take 3 to 4 years. Concomitant with the residential buildings, other facilities like schools, dispensary, shopping centres, etc. have also/be planned in the new /to area. Keeping this in view and also keeping in view the limitations, regarding the extent of construction that could be undertaken, the following plan is proposed:

4th Plan

Rs.

1972-73	- 9 quarters plus dispensary in the Institute campus	3,00,000
1973-74	- 30 houses in the Institute campus.	7,50,000

5th Plan

1974-79	- 150 houses to be built in the Institute campus at the rate of 30 houses a year.	37,50,000
	Development of land at Maragowdanahalli.	7,50,000

6th Plan

Rs.

1979-84 - 150 houses to be built at the new colony. 37,50,000

Main services to be provided. 7,50,000

Both the development of the land and the construction of the houses and other buildings will involve a total outlay of over 100 lakhs of rupees during the 4th, 5th and 6th Plan periods. To handle a work of this magnitude, the small skeleton unit charged with the responsibility of construction of staff quarters working under the Engineering Unit of the CSIR has to be adequately strengthened with more staff and equipment.

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|-----|----------------------------|---------------|
| 4.1 | <u>Nature of activity:</u> | Technical. |
| 4.2 | <u>Classification:</u> | Construction. |
| 4.3 | <u>Orientation:</u> | Welfare. |

SETTING UP REGIONAL EXPERIMENT STATIONS
(IV & V Five Year Plans)

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2.	CFTRI Regional Experiment Stations at Bombay, Ludhiana and Calcutta.	439

Discipline: Experiment Stations.

SETTING UP REGIONAL EXPERIMENT STATIONS

1. Project Title:

Experiment Station in the Union Territory of Goa.

2. Justification.

The area has vast potentiality for research and developmental work in meat processing including utilisation of by-products. Number of animals slaughtered in 1969-70 (given below) indicates the appreciable extent of slaughtering in the area.

Cattle	...	8386	animals
Buffalo	...	1495	"
Sheep	...	872	"
Goat	...	3913	"
Pig	...	1341	"

A modern slaughter-house is proposed to be set up at Ponda to provide good quality meat, ensure proper utilisation of by-products from waste and also to ensure a better export.

In addition, the area has diverse raw material and also food processing industries in different fields (Fruit, fish and meat processing units -5; syrup and pickle units - 4; deep freezing plants - 7; organised bakery -15; cashew processing units -8; confectionery units -8; cereal grinding mills -275. The territory produces Rs.34.57 lakhs worth of canned and frozen products and exports Rs. 4.4 lakhs worth of preserved products (fruit and fish) and Rs.18.87 lakhs of cashew apple is coming up under the technical guidance of CFTRI).

It has an extensive cashew growing area with a production of Rs.85.5 lakhs worth of cashew (1969-70) with 8 cashew processing units. Goa has an extensive area under pineapple cultivation. Mango is also an important fruit of the area.

Fish landing in Goa is quite substantial (28,000 tonnes in 1969-70); important fisheries are mackerel, oil-sardine, cat fishes, silver belley, ribbon, hilsa, penaeid prawn, sciaenids and anchovielle. Government of Goa has one modern fish meal and oil plant located at Vasco de gama which is not working for quite some-time past. Also it has two mechanised purse seiners for catching pelagic fish, but these are not being utilised at present. When these are put into commission it will give a great boost to the technology of

certain fish processing industries. In addition, people of Goa are habituated to traditional salted and/or dried products and this would require development of proper curing industry in the area as quality of such products manufactured at present is poor.

Furthermore, National Institute of Oceanography (CSIR) is situated at Panaji (Goa). The Institute which is working on the marine biots, will be an added advantage for undertaking research and developmental work on the processing and utilization of both conventional and non-conventional marine resources.

The facts and figures establish the suitability of Goa area for the location of an Experiment Station which can attend to various technological problems of food industries of the region, ensuring better utilisation of raw materials and better products, evolving new products and by-products and minimising wastage. A Station at Goa will cater to the research and developmental requirements of the region particularly in relation to meat, cashew, fish, bakery, beverages, rice milling and fruit (Pineapple and Mango).

3. Objectives:

- i) To carry out research and developmental work on meat and fish technology.
- ii) Economic survey of available raw materials and industry of the region.
- iii) To render technical assistance to the manufacturers of the region in the matter of giving advice on technical problems and quality control.
- iv) Extension of processes and products developed by CFTRI and its field stations.

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|-----|----------------------------|--|
| 4.1 | <u>Nature of activity:</u> | Scientific. |
| 4.2 | <u>Classification:</u> | Material Research, Process Research, Product Research and Extension. |
| 4.3 | <u>Orientation:</u> | Industrial & Economic. |
| 5. | <u>Period:</u> | April 1972 - Continuous. |

Discipline: Experiment Stations.

SETTING UP REGIONAL EXPERIMENT STATIONS

1. Project Title:

CFTRI Regional Experiment Stations at Bombay, Ludhiana and Calcutta.

2. Justification:

India is a vast country with different climatic and soil conditions in different parts of the country. With the result, agricultural, horticultural and other raw materials intended for food processing or for use as food vary from place to place. Furthermore, there is wide differences in cultural and food habits of people from region to region. Regional variation is also observed in traditional processed food products and food preparations. In addition, there is unevenness in the matter of technological development in the country.

The need for Regional stations with different disciplines and full extension and consultancy service is being increasingly felt. With the increased pace of industrialisation including food processing and with the increased knowledge of food processing, food science, raw material handling, etc., establishment of fully equipped Regional Stations has become a necessity. For this purpose it is proposed to establish three regional stations in the 5th Plan Period, one to cater to the need of Northern Region (proposed Ludhiana Regional Station), one for Central and Western Region (proposed Bombay Station) and one for Eastern Region (proposed Calcutta Station). Central Food Technological Research Institute should serve the National need, coordinate and guide the activities of the regional stations in addition to serving the specific need of Southern region.

3. Objectives:

- i) Economic survey of available raw materials (fruits, vegetables, cereals, pulses, spices, meat, fish, poultry) and industry of the region.
- ii) Varietal screening of the raw materials for the purpose of processing.
- iii) Collaboration with the horticulturists, agriculturists, growers and other State Departments.
- iv) To attend to the technical problems of the industry of the region.
- v) Development of new products/processes.
- vi) To render technical assistance to the manufacturers of the region in the matter of giving (a) advice on technical problems, and (b) quality control.

vii) Extension of processes and products developed at CFTRI and Stations and to follow up the work with a view to provide effective liaison between CFTRI and various organisations of the region. This is necessary not only to utilise the results of research of CFTRI including its different Stations but also the knowledge already available. Establishment of link with rural agencies, State Government and other semi-government agencies and Corporations.

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|-----|----------------------------|---|
| 4.1 | <u>Nature of activity:</u> | Applied & Developmental. |
| 4.2 | <u>Classification:</u> | Material Research, Process Research, Product Research, Consultancy & Extension. |
| 4.3 | <u>Orientation:</u> | Industrial & Economic. |
| 5. | <u>Period:</u> | April 1975 - continuous. |

